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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

January Meeting, Society of Gas Lighting.

OFFICE OF THE SECRETARY, Dec. 26, 1896.

The January meeting of the Society of Gas Lighting will be held in the works of the New York Mutual Gas Light Company, Eleventh street and Avenue D, New York, at 3 P.M., of the 14th inst.

FRED. S. BENSON, Secretary.

[OFFICIAL NOTICE.]

Thirteenth Annual Meeting, Ohio Gas Light Association.

THE OHIO GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY,
COLUMBUS, O., Jan. 4, 1897.

The thirteenth annual meeting of the Ohio Gas Light Association will be held in New York city, Wednesday and Thursday, February 3 and 4, 1897, in one of the parlors of Madison Square Garden.

Papers will be read by—

Mr. E. S. Templeton, Secretary and Treasurer Ashtabula (O.) Gas Company, on "Advertising."

Mr. T. C. Jones, Superintendent Gas Company, Delaware, O., on "Gas Stoves: Their Introduction, Construction and Use."

Mr. Irvin Butterworth, General Manager Gas Company, Columbus, O., on "A Curious Gas Explosion."

Mr. E. T. Lloyd, Secretary Western Gas Construction Company, Fort Wayne, Ind., on "Gas Engines."

Mr. G. H. Christian, Superintendent Norwalk Gas Company, Norwalk, O., on "State Regulation of Corporations."

The Question Box will be given more than its usual attention, and every member is earnestly requested to contribute to it.

One of the features of our meeting last year was the Executive Session, held on the morning of the second day. It afforded an opportunity for a freer exchange of ideas than is given in the regular sessions, and the Executive Committee have deemed it advisable to hold a similar meeting this year, on the morning of February 4.

Efforts have been made to get reduced railroad rates, but so far without success, excepting by the use of "party" ticket. In order to avail ourselves of these tickets it will be necessary for at least 10 to travel on one solid ticket on same train.

On account of its central location, as regards our membership, the Executive Committee thought it would be pleasant for as many as possible to meet at Columbus and leave there on the evening train, February 1, reaching New York city the next afternoon. Provided a sufficient number will arrange to go in this way, special sleeping cars can be secured for the exclusive use of our party. The rate of fare from Columbus to New York city, conditioned upon the use of this ticket, is $12.75, and charge for sleeping car berths is $3.50. Those who do not find it convenient to start from Columbus can get the advantage of the reduced rate, providing they can get a sufficient number to go in one party, as follows: From Cincinnati, $15.15; sleeping car berth, $4. From Cleveland, $11.90; sleeping car berth, $3.

In order that arrangements for a pleasant journey may be assured, the undersigned requests that all contemplating leaving with the Columbus party communicate with him, in order that ample sleeping car accommodations may be reserved.

The change in place of meeting was made by the Executive Committee, in accordance with a vote taken by the membership; and we hope that everyone who voted for the change will be present at the meeting, together with as many other gas men as can possibly find it convenient to attend.

Application blanks for membership can be obtained of the Secretary, who will be glad to furnish any further information.

A. P. LATHROP, Secretary.

BRIEFLY TOLD.

DEATH OF COLONEL JOHN W. NEWELL.—We regret to have to report the death of Colonel John W. Newell, Secretary and Superintendent of "The Gas Light Company of the City of New Brunswick," New Brunswick, N. J., whose summons came on the morning of the 5th inst.; and his passing out ended a life that had been marked by usefulness and worth, covering a period of many years. He was born in Franklin, O., in 1821, and his early youth was passed in honest and well maintained struggles with fortune, that eventually fitted him to go

on to leadership and regard. Perhaps his ancestry could be charged with some portion of the credit that came to him through his earnest life, for his paternal grandfather served as an officer on the staff of that rugged old Revolutionary hero, General Anthony Wayne. Mr. Newell, who had been engaged in mercantile operations for a time, and with varying success, on the outbreak of the War of the Rebellion enlisted for the defence of the Union. His knowledge of finance and principles of trade was such that the authorities appointed him Paymaster of the main division of the Army of the Potomac, and, at the close of the wretched dispute, he was assigned to settle the accounts of the country with its troops of the New Jersey contingent, with headquarters at Trenton, New Jersey, which State had previously honored his family with the highest confidence at its command—his brother, Mr. William Newell, was Governor of New Jersey for the term 1857-1860. Having closed his accounts with the country and the State, the subject of our memoir accepted the position of Superintendent to the Gas Light Company, of New Brunswick, N. J. (the plant of which was constructed by Mr. Joseph R. Thomas some years prior to Col. Newell's advent in its management), and there his accuracy and responsibility were fairly tested. All we have to say about his subsequent dictation of the affairs of the Company is that it prospered under his dictation and advice, and that to-day its obligations—even in the instance of capital account—are nothing. Deceased was elected a member of the American Gas Light Association, at the third annual meeting, held in New York, October 20th, 1875, and his portly body and happy mentality were often in evidence at subsequent assemblages. He was prominent in the Masonic circles of New Jersey, was a member of the Sons of the American Revolution, of the Loyal Legion of Honor, and of the New Jersey Historical Society. His immediate survivors are his widow and three children.

Death of Mr. Samuel M. Young.—Another death, which appeals to the best thought of those earliest connected with the American gas industry, is that of Mr. Samuel M. Young, who, since the reorganization of the Toledo (Ohio) Gas Light and Coke Company, in 1868, acted as its President. Deceased, who was born in Lebanon, N. H., December 29, 1806, was the son of the Hon. Samuel Young, a prominent New Hampshire builder, who served his district in the New Hampshire Legislature when it was a really honorable task to accept the duties of such an office. Educated in the ways of the law, in the office of John M. Pomeroy, of Burlington, Vt., our subject elected on his graduation to try his fortunes in the West, locating in Maumee, Ohio, in 1835. From thence on his career was one of uninterrupted success. In 1852, when Toledo proper was named the county seat of an Ohio district that theretofore had been in dispute and contention, he removed to Toledo, and his life thereafter was bound up in the commercial development of that city, using the words "commercial development" in their best sense. Its interests were his; and about wherever one could look and find, there would one find the investments of Mr. Young—it should have been earlier said that Mr. Young retired from the active practice of the law in 1856, thereafter confining himself with every possible success to higher mercantile affairs. He was, in every sense, a man of pertinacity, who knew the value of that which he owned, and who played no small part, even in his later days, in directing the possible outcome of his possessions.

The Possible Chance of an Alteration in the City Gas Rate.—The interregnum existing between now and the time of the appointment of the Committees that shall "shape legislation" for the many and varied interests of New York State, is less considerably than a fortnight, so perhaps it is better to wait than to predict. The general opinion seems to be that the Legislature will direct that gas, "in cities of over so many" inhabitants, shall be sold at such a price. Having no fear as to the stability of the gas business, but having much fear that the honesty of the legislators might be impugned, we suggest to Mr. Gledhill, to Mr. Cantor, and to others of their assembly, that their efforts for "cheap gas" may be about as ill-smelling as are their political and other records. The Gas Companies of New York and Brooklyn are pretty nearly done with payments on political account; and the sooner that the Albanians understand it the better it will be for them.

Notes.—Mr. B. A. Ward, former Superintendent of the plant at Michigan City, Ind., has been appointed Superintendent of the Wichita (Kas.) Gas, Electric Light and Power Company.——Mr. S. R. Dutton has been appointed Superintendent of the Gas Company of West Chester, Pa., vice Mr. J. J. Humphreys, who has accepted a responsible position with the Worcester (Mass.) Company.——The properties of the Merced (Cal.) Gas and Electric Light Company have gone into new hands. Mr. A. C. Swain will be superseded in the management.——The name of the corporation that has succeeded to the rights and properties of the Consolidated Gas and Electric Light Company, of Rye and Port Chester, Westchester county, N. Y., is that of the Westchester Gas and Electric Company. It is capitalized in $300,000, and its Directors are: A. S. Chester, Westerly, R. I.; G. V. Forster, N. Y. city; Wallace Hackett, Portsmouth, N. H.; H. T. Jennings, Mount Vernon, N. Y.; Paul Armitage, Bay Shore, L. I., and H. D. Donnelly, Brooklyn, N.Y.

Dollar Gas.

The *Engineering Record* for the 2d inst. had this fair editorial mention respecting the agitation for "dollar gas" in New York city:

It appears very probable that during the present winter the Gas Companies of New York city will be called upon to supply gas at $1 per 1,000 feet, or prove to the satisfaction of the public that such a thing is not a commercial possibility. No one familiar with the subject will attempt to maintain that a city of the size and location of New York could not profitably be supplied with illuminating gas of good quality at the price named. Indeed, were the franchise for supplying the entire city with gas to be granted to a company now, we have no doubt that an abundance of capital would be ready to undertake the work at even a lower figure.

It is clear that the seven Companies supplying New York city at the present time, which includes the operating of twelve separate gas plants, cannot meet the demand for dollar gas with the same ease that a single company with one or two large plants could. Had it not been for the folly of allowing one company after another to enter the field, New York might have had dollar gas years ago. In the gas industry competition may be "the life of trade," but it does not bring cheap gas to the consumer; and of late years the relief has come only through legislative enactment.

We have no doubt that some officials of the New York Gas Companies would give us dollar gas to-morrow if the decision rested entirely with them. They appreciate the fact that such a reduction would greatly increase the consumption of gas for fuel purposes; that it would meet the demand for a cheap fuel gas, and that the moral effect of a voluntary reduction in price would be very great. No more effective obstacle could be placed in the way of prospecting fuel gas companies.

At present our gas supply, as furnished by the different companies, ranges from about 22 to about 30-candle power. The average is about 26 candles, but if allowance is made for the larger quantity of the lower candle power gas consumed, the average would not be far from 25 candles. The bulk of this gas is water gas, while the rest is coal gas. The average heating power of this supply is about 700 heat units per cubic foot, and it is not probable that any fuel gas company selling gas for 40 to 50 cents per 1,000 would furnish a gas having more than 350 heat units per foot. It is evident, therefore, that a company selling an illuminating gas equal to our present supply for $1 per 1,000, would give the consumer as much for his money as another company selling fuel gas only at one-half that price. To this must be added the great advantage of having one gas supply both for heating and lighting purposes.

The plea is being urged that our local legislative body should be given power to "govern the gas companies," with "authority to subpœna witnesses, examine the books and regulate the conduct of the gas companies." It would be difficult to imagine a movement more unfortunate, both for the consumers and the companies, than the one suggested, and no better proof of this is necessary than the recent granting of a franchise to a fuel gas company, a grant which most of those who voted for it now look upon as ill-advised.

A permanently constituted Commission of qualified persons is a much better body to deal with all questions of this character, not only here, but throughout the State. It is impossible to see why such a Commission, which works well in Massachusetts, should not prove equally satisfactory in New York.

This demand for cheaper gas is a popular cry and is being urged in many communities throughout the land. In some of our cities the mistake has been made of granting rights to a competing company in districts already served with the almost inevitable result that the two companies combine sooner or later, and the needless duplication of generating plant and service mains has to be paid for, in the last analysis, by the consumers of the product. The furnishing of illuminating gas should be treated fairly as a business enterprise in which investors are warranted in anticipating a fair earning from their capital, and any community now served by a gas company should be ready, in calling for gas at $1 a 1,000 feet, to contract that no competing company shall be allowed to lay mains for similar service for a period of 10 years at least. Such an agreement we are confident would be in no wise contrary to public policy, while it would afford an assurance to investors in the securities of such companies that their interests are considered and their investments are reasonably secure.

Trials of Gas Stoves.

The London *Journal* reports the following summary of the more important results of a number of trials of heating with gas stoves, of which voluminous reports have recently been published, by Prof. A. von Ihering, of the Imperial Technical High School at Aix-la-Chapelle, in the *Journal fur Gasbeleuchtung:*

A room having an air space of about 3,170 cubic feet was chosen for the trials. The walls were exposed on the south and west, and on the east only abutted on the hall and staircase, so that the loss of heat through them was relatively great. Eight different makes of stoves, sent out as suitable for heating a room of the above capacity, were used; and the trials were directed specially to the following points: (1) The consumption of gas needed to make the room warm; (2) the consumption of gas needed to maintain it at a given temperature; (3) the composition of the gas; (4) the temperature of the exit gases; (5) the loss of heat in the exit gases, or the utilization of the heat generated in the stove; (6) the heating value of the gas used; (7) the amount of carbonic acid in the air; (8) the temperature of the room at different points, and (9) the mean temperature; (10) the degree of moistness of the air; and (11) the relative quantities of heat radiated from the reflectors.

The stove on trial was placed in the middle of the east side of the room—beneath the mouth of the chimney—and the gas meter in the north-east corner of the room. The outlet pipe was forked, so as to admit of the introduction of a temperature regulator in one branch. The two branches were furnished with stopcocks, the main tap being placed on the inlet to the meter. A fourth stopcock was provided on the pipe, close to the stove itself. By this arrangement, it was possible to work either with or without the temperature regulator. The main tap was only used in the trials made on all the stoves at a fixed consumption of gas. The products of combustion were conveyed to the chimney by a pipe 3½ inches internal diameter, and about 6 feet in length, with which a tight joint was made to the stove. A hole was bored in the pipe 8 inches above this joint for the insertion of a cork through which a thermometer was passed, so that its bulb reached to the middle of the pipe. Opposite the thermometer the pipe was bored, and a tube fixed in it for the withdrawal of samples of the hot gas. A Böhm temperature regulator was used. Its action depends on the partial closing of a valve set in the supply pipe, by the extension of a spring, which is very sensitive to small changes of temperature. The temperature was taken by 19 thermometers, of which six were on the floor level, four in the corners of the room, and one in the middle of the east, and one in the middle of the west wall. Six were placed 5 feet 2 inches above the floor; and six more above them and close to the ceiling (9½ feet from the floor). The three thermometers of each set were in a vertical line. One thermometer was suspended at a height of 5 feet in the middle of the room. These nineteen thermometers were read hourly, as were also one in the middle of the room adjoining the experimental room on its north side, one on the staircase, one in the room below, one in the room above the experimental room, and one placed outside the window of the room on the north side. The latter served to give the temperature of the outer air; but its readings were compared with the various temperatures recorded at the local meteorological office. This office was at the same altitude, and only 100 yards distant, so the barometer readings taken there sufficed.

The spent gases were analyzed in an Orsat's apparatus, and two or three analyses were made for each trial. The temperature of the spent gases was read each time. To ascertain the excess of air, the free oxygen was determined as well as the carbonic acid. Carbonic oxide could only be detected by the palladium paper reaction either in the exit gases or the air of the room. The carbonic acid in the latter was determined by aspirating 10 litres of air through a weighed caustic soda tube protected by calcium chloride. The sample of air was drawn at a height of about 32 inches, and at about 20 inches from one side of the stove. To ascertain if the air of the room was rendered more dry or more humid by the gas fire, hygrometers were suspended half way up the walls on the west and east sides of the room. In order to draw conclusions as to the degree of perfection of the construction of the reflectors, it appeared desirable to estimate the heat radiated from them. For this purpose readings were made at nine places in the plane of radiation of the stove with a thermopile and galvanometer. An attempt to ascertain the absolute value of the heat radiated, by means of a calorimeter coated with lampblack, was not successful, as heat rays issued not only vertically to the plane of emission but also obliquely, and the latter did not strike the calorimeter.

It was desired to make an extended trial of each stove, as well as the ordinary day trials, but this could not be carried out with all the stoves, owing to the room being needed for other purposes. The time and consumption of gas required to raise the room to 68° F. were first ascertained, and then the gas consumption necessary to maintain the temperature. On the following day, after raising the room to the above temperature, the gas consumption was set at 17.6 cubic feet per hour, and the trial continued for seven hours. In some cases, a continuous trial lasting one week, with the temperature regulator in action, was made. The weather was for the most part very unfavorable to the trials, and the temperature outside was very seldom below freezing point. The house in which was the experimental room had been uninhabited prior to the trials, and a gas stove was therefore kept burning in that room for 17 days before the trials were begun. At the close of each day's trial, the doors of the room were opened, so that by the following morning the room had attained the temperature of the rest of the house, which remained almost constantly between 41° and 43° F.

The heating value of the town gas was ascertained both calorimetrically and by calculation from its composition. Thirteen determinations by Junker's calorimeter gave a mean value of 155.8 calories per cubic foot. To calculate the heating value of the gas from its composition by Slaby's formula, the density of the unsaturated hydrocarbons in it must be known; and to find this, the specific gravity of the gas was determined before and after their removal by fuming sulphuric acid. The mean of 12 analyses of the gas showed its percentage composition to be—

Hydrogen.	Methane.	Carbonic Oxide.	Hydrocarbons.	Nitrogen	Carbonic Acid.	Total.
54.0	34.2	5.2	3.3	2.2	1.1	100

The mean specific gravity by Schilling's effusion apparatus was 0.3826. From the above and other calorimetric determinations, and from the values calculated from the analyses, it was found that the mean calorific value of the gas was 155.7 calories, taking the water formed as liquid.

The quantity of air needed for the combustion of the gas, and the volume of the products were calculated. One part by weight of each of the following gases requires the stated parts by weight of air for its combustion—

	Hydrogen.	Unsaturated Hydrocarbons.	Methane.	Carbonic Oxide.
Air needed.....	34.39	14.667	17.11	2.457

From these data, the gas in question was found to require 5.466 times its volume at 15° C. and 760 mm., or 5.1816 times its volume at 0° C. and 760 mm. It yielded 6.201 times its volume of products of combustion at 15° C.; and their percentage composition was: Carbonic acid, 8.392; aqueous vapor, 21.597; nitrogen, 70.011. The volume of gas and air together was 6.466; and therefore the contraction on combustion amounted to 0.265 or 4.1 per cent. of the original volume. The next table shows the percentage composition of the products of combustion with different proportions of air—

Volumes of Air in Terms of the Theoretical Quantity Needed.	1	1.5	2	3	4
Carbonic acid..	8.392	5.825	4.461	3.038	2.304
Aqueous vapor.	21.597	14.993	11.480	7.829	5.928
Nitrogen.....	70.011	72.728	74.170	75.685	76.460
Oxygen.....	—	6.452	9.880	13.463	15.310

The general equation for calculating the quantity of air from the proportion of carbonic acid in the products of combustion was deduced. If a = the percentage by volume of carbonic acid, and m = the multiple of the theoretical volume of air required, then—

$$m = \frac{49.36 - 5.8819a}{5.1816a} + 1$$

The quantities of air for all the trials were deduced by aid of this equation. The value of m thus found permits of the volume of the exit gases at the temperature at which they leave the stove being readily deduced. With m times the theoretical quantity of air required for x volumes of gas burnt per hour, and with the exit gases at $t°$ C., and the barometer standing at b mm., the volume of exit gases per hour would be—

$$= (0.739 + 5.466m)\, x \frac{760}{b} \cdot \frac{273 + t}{288}$$

The volumes of exit gases for all the trials were deduced from this equation.

The specific heats for a temperature of 100° C. are, according to Slaby: For carbonic acid, 0.216; for aqueous vapor, 0.459; and for nitrogen, 0.247. These values, with the proportions by weight of the respective gases found in the exit gas from the combustion with the

Makers of Stove.	Corrected Consumption in Cubic Feet per Hour.		Temperature of the Rooms in Degrees F.		Volumes of Air Used in Terms of the Volume Theoretically Necessary.	Heat Developed per Hour in Calories.		Heat Developed.	
	In Attaining the Desired Temperature.	In Maintaining that Temperature.	Before the Trial.	Mean Temperature Maintained.		In Attaining the Desired Temperature.	In Maintaining that Temperature.	Percentage Lost in Exit Gases.	Percentage Rendered Available.
Warstein Foundry	31.9	17.8	43.3	57.2	2.842	4,433	2,471	11.00	89.00
R. Kutscher, of Leipsic	41.7	23.7	41.9	60.8	5.890	5,788	3,285	18.10	81.90
J. G. Houben, of Aix-la-Chapelle	33.7	29.4	41.9	66.2	5.155	4,671	4,076	29.20	70.80
F. Graf, of Aix-la-Chapelle	26.0	17.2	41.5	57.7	4.628	3,600	2,389	8.00	92.00
Schäffer and Walcker, of Berlin	33.0	24.7	40.8	58.8	4.195	4,586	3,424	24.40	75.60
A. Michel, of Aix-la-Chapelle	29.1	22.6	43.3	59.4	3.676	4,041	3,132	18.40	81.60
German Continental Gas Co.	29.9	22.5	43.2	59.0	3.670	4,153	3,128	12.50	87.50
F. Siemens, of Dresden	.....	13.4	.....	64.4	1.986	.....	1,858	4 32	95.68

theoretical quantity of air, show a loss of 5.55 calories in the exit gases from the combustion of 1 cubic foot of gas for a difference of 100° C. between their temperature and the temperature of the room. But a cubic foot of gas develops 155.7 calories. The latent heat or heat of vaporization of water amounts, however, to about 17 calories, and hence the calorific value of a cubic foot of the gas, supposing the water formed by combustion remains as steam, is only 155.7 — 17.0 = 138.7. The loss of heat through the exit gases is, therefore, equal to $\frac{5.55 \times 100}{138.7}$ or 4.0 per cent. of the total available heat of the gas. With m times the quantity of air theoretically required for the combustion, the heat lost through the excess of air is 4.51 $(m - 1)$ calories per cubic foot of gas consumed for a difference of temperature of 100° C.; and the total quantity of heat lost per hour becomes $= 5.55 + 4.51 (m - 1) = 4.51m + 1.04$, or for every degree difference between the temperature of the exit gases and that of the air of the room the loss of heat per cubic foot of gas burnt is equal to $0.0451m + 0.0104$ calories. By the aid of this factor, the loss of heat for any given consumption of gas, and any difference in the temperature of the air and exit gases, is readily calculated.

The results of the more important trials are given in the foregoing table, which is compiled from the immense mass of figures given by Professor von Ihering. The examples have been selected with a view to giving a fair impression of the general efficiency of heating by gas; and they are not necessarily indicative of the relative merits of the different makes of stove. Experiments were made with Michel's stove on the influence of the size of the exit flue. Screens or dampers fitting the pipe closely, and each having a circular hole of known diameter, were inserted in turn at the base of the pipe. The greatest efficiency was found when the orifice was only 0.79 inch in diameter. The heat lost in the exit gases was then only from 3 to 5 per cent. of that developed; and this result appeared to be due to a reduction of the excess of air, brought about by the contraction of the flue. The efficiency increased with a diminution of the gas consumption. The Dessau and Siemens' stoves showed similar results when the regulating flap in the exit pipe was partially shut so as to contract the outlet to about 0.79 inch.

It appears that, by selecting an exit pipe of suitable diameter, the efficiency of the stoves can be raised from 80 to 96 or 97 per cent. A low temperature of the exit gases is found with the Graf stove. This is in part due to a narrow outlet, and in part to a water cooler which enters into its construction. The water began to boil within a quarter of an hour of the lighting of the stove and continued in a state of noisy ebullition, while the humidity of the atmosphere became so great that water condensed on the walls, etc., and the trial had to be broken off.

On comparing the transmission of heat by the walls with figures obtained by the use of the generally recognized coefficients for the various materials, it was found that nearly one and a half times the calculated amount of heat was actually transmitted. It appeared the coefficients were too low—especially for outer walls, and the coefficient for heat transmission should be about 50 per cent. higher for new buildings than for old ones which have been inhabited for a long period.

With regard to the amount of carbonic acid present in the air of the room, it is to be observed that the room was ventilated through the doors only, and that windows were not opened during the continuance of the trials. Consequently air containing much carbonic acid may have remained near the floor of the room. The samples of air for examination were taken at a height of 32 inches, and there were found from 2.85 to 7.16 parts per 1,000 of carbonic acid.

The experiments on the radiating efficiency of the reflectors showed that the radiant heat increased with the consumption, and also increased with a diminution of the exit pipe. The Warstein stove appeared to have the most efficient reflectors, and next in order came the Michel and the Siemens. With these two, the radiation from the lower part of the reflectors was far greater than from the upper.

Gen. Collis on the Street Lighting of Paris and London.

General C. H. T. Collis, Commissioner of Public Works of New York city, recently made a hurried trip to Europe, in the course of which he inspected closely some of the "public works" of Paris and London. On his return to New York the editor of the *Sun* succeeded in obtaining some account from him of his impressions respecting the works that he had inspected, and the result is a most readable article printed in the newspaper named in its issue for December 30th. General Collis has this to say anent—

Street Lighting in Paris.—The illumination of Paris, both by gas and electricity, is in charge of private corporations. One company supplies all the gas consumed in Paris for all purposes, while there are at least half a dozen electric companies having monopoly charters for certain districts. The gas mains are all laid in the sewers and the electric light conductors are laid under the sidewalk. The price of gas is about $2.04 per 1,000 cubic feet. As a result, small hotels still supply their guests with candles and charge them in the bill. Larger hotels use electricity, but I saw none using gas. For municipal purposes, however, the price is a little over $1. The lamplighters are appointed by the city authorities, but paid by the gas company, and each evening before starting out they may be seen in groups receiving their instructions from their foremen, these instructions being dependent upon the condition of the atmosphere, the moon and the treasury. All domestic gas pipes are located on the outside of the walls of houses, and not inside and out of sight as with us.

Strangers who are accustomed to confine their view of Paris to the grand avenues and boulevards and the passages with their brilliant little shops, carry home with them the impression that the French metropolis is the best lighted city in the world, but this is far from being the fact. Those streets which are continually upon dress parade are superbly lighted, it is true, but the streets in the densely populated parts of the city, inhabited by the poorer classes, are as dingy as any streets I have ever seen. In some of them there is only just sufficient light to escape total darkness. Whether this is due to the fact that the gas company gets only half rates for street lighting, or to Government economy, I do not know, but I am sure that similar streets in New York are better lighted. The Champs Elysées is naturally the most brilliantly illuminated of all. Americans who drive at night from the Madeleine or the Rue de Rivoli, across the Place de la Concord, up the Champs Elysées to the Arc de Triomphe, find a carriageway splendidly illuminated by gas lamps at short intervals, using Welsbach twin burners similar to those now in use on our own Boulevard, picturesquely supplemented with a never ending stream of cabs with their yellow-burning oil lamps, that make a pleasing contrast with the white of the gas, while thousands of cyclists dart here and there behind their little lights of all variety of color; but let the visitor take himself to Montmartre or the fringe of the Quartier Latin and he will find the butcher or the greengrocer selling his provisions with the aid of a naphtha lamp or flambeau put up and maintained at his own expense. In the poorer districts the lamp posts are at long intervals, but they are equipped with 5 and 6-foot burners, while in New York ours have been only 3-foot burners since gas was introduced 70 years ago.

I may say here, in parentheses, that it looks to me as though the Welsbach gas burner would become the approved method of Parisian illumination.

And here are his impressions respecting—

London Street Lighting.—The lighting of London, like the supply of water, is in the hands of private corporations, much to the regret of the authorities. The cost to the city is about 56 cents per 1,000 cubic feet for gas. The cost of electric light I did not ascertain, but as there is very little of it, it was not material. Some parts of London are well illuminated, but this is owing more to the lamps than the power of the gas or the number of lampposts. The designs of the lamps are not only ornamental, but they get more light out of the same amount of gas than any others I have seen. Perhaps the handsomest are those on Northumberland avenue, near Trafalgar square, which consist of a group of three globes set in bronze cups and capped with coronets; the whole surmounting a very ornate post about 20 feet high. But the ordinary street lamp found in the chief streets of the metropolis is also most attractive. It is about the size and shape of a lady's parasol, the interior of the roof being white glazed, and the glass kept beautifully clean. The effect of long rows of these lamps placed at short intervals is brilliant. Nevertheless no street lighting in Paris or London excels the Edison lamps on Fifth and Madison avenues for beauty or illumination.

In localities remote from the hotels and private residences, where the humbler classes dwell, the lighting is not so good as in similar localities in New York, though the fogs of London render the best illuminating essential.

Petroleum, Asphalt and Bitumen.[1]

Prof. A. Jaccard, of the Geological Academy of Neufchatel, in a treatise on the subjects named in the heading, remarks that petroleum, asphalt and bitumen may be regarded as so related to one another, so like in origin and properties, as to be capable of being considered in the same treatise; and we may, therefore, speak properly now of one, now of the other. The oldest known form of natural hydrocarbon was the bitumen which rose to the surface of the Dead Sea, called from that circumstance the Asphaltum Lake. Tradition says that it used to appear on the surface in considerable masses, and was collected by the Arabs and exported to Egypt, where it was used in embalming, and for a few purposes in the arts. The ancients were also acquainted with the liquid form of bitumen, petroleum. Herodotus speaks of the mineral oil of Zante; and other Greek authors mention the springs of Agrigentum, the product of which was burned in lamps, and known as Sicilian oil. The fire worshipers of Persia erected temples over the burning springs.

Of the use of these substances in the middle ages, and later, we chiefly know that the petroleum springs of Pechelbronn, in the 16th century, spontaneously furnished mineral oil in such quantities that the peasants around used it to feed their lamps and grease their carriage wheels. The virtues of the mineral springs of the Jura Mountains were made known in 1712 by a Greek doctor, who pronounced them a treasure that had been unknown from the beginning of the world. Since then new sources have been discovered in all parts of the world, and the uses and applications of petroleum have been immensely and wonderfully extended. The discovery of the American beds of petroleum and the application of industrial processes of distillation to them have been the beginning of a new industry, and of largely extended researches in all countries. Leopold von Buch (1801), who seems to have been the first to discuss the origin of the natural hydrocarbons scientifically, supposed that they were of animal origin. Violet d'Aoust, in 1814, believed them to be of the same origin as the rocks with which they were associated, native eruptive products, the resultants of causes still unknown; and repeated this opinion ten years later. Puvis thought, in 1836, that bitumen penetrated the rocks, according to their porosity, after their formation. Rozet, in 1836, thought that the bitumen of Pyrimont was sublimed from the depths of the globe through a crack that marked the direction of the formation, and was condensed in the porous rocks. Millet, in 1840, thought the same bitumen was derived from the decomposition of accumulations of vegetable matter, and ran down through the rocks. Itier, in 1839, supposed that the bitumens of the Jura were derived from the adjacent bituminous schists, which were full of vegetable fossils. Daubree, in 1850, believed that the mode of their formation was similar to that of coal, but admitted the possibility of there having been derived from mineral synthesis. These views and the theory of volcanic origin have been reiterated in various modified shapes by their authors. M. Lartet published, in 1866, a valuable study of the geological relations of the bituminous deposits of the region of the Dead Sea.

When the mineral oils of the United States had become a prominent subject of attention, Mr. Leo Lesquerez made an elaborate discussion of them in the form of a letter to Liebig, in 1865, in which he gave his reasons for supposing that they were the products of the decomposition of marine plants. Dr. Sterry Hunt about the same time concluded, from an examination of the petroleum beds of Kentucky, that the oil, or the organic substances from which it was produced, were deposited in the strata where the oil is found contemporaneously with the formation of the rock. Mr. Orton, after a thorough study of the petroleum of the Trenton limestone of Ohio, published his conclusion in 1884, that it was of organic origin—derived from the decomposition of vegetable and animal matter. The supply could not be renewed, and was therefore not inexhaustible. It was probably produced at the ordinary temperature and not by distillation.

Some authors, assuming that these hydrocarbons are derived from the decomposition of organic matter, have tried to imagine the manner of the process, and to distinguish between it and ordinary or putrefactive decomposition.

It is apparent that nothing more than the value of a hypothesis can be attached to these speculations. Nothing indicating sublimation has been observed where the theory supposes it to have taken place; the operation of a natural chemical distillation is not proved by any evidence of such a process having anywhere taken place. The opinions of MM. Daubrée, Lartet and Coquand, in favor of a chemical origin, being based upon studies of the formations, themselves, are regarded as being of more substantial value. These authors, however, are judged to have erred in confounding the original formation of the substances with their appearance where they are found—which, in the view of the author, are two very different affairs.

A bituminous limestone of the Val de Travers, Switzerland, is formed almost wholly of shells, *echini*, and similar fossils, held together by a calcareous cement. Some of these fossils are only casts, the shell having been absorbed, while the interior, otherwise empty, is partly filled with a viscous bitumen, the quantity of which is proportioned to the size of the shell. In the smaller brachiopods there is only enough to color the inclosing rock a chocolate brown; in the larger ones it forms a lump which is softened by warming. The bituminous limestone of Auvernier is marked by infinitely numerous little cavities, such as are seen in tufas, which are made visible by the presence of a brown substance, the residue of a volatilized bitumen. It also contains casts or impressions of fossilized shells, and in these again are deposits of brown or blackish substance—the organic matter of the mollusk, transformed into bitumen. The cavernous or breccialike rock of Bevais, a few miles south of Auvernier, contains what we might perhaps call glutinous inclusions—cavities corresponding with the internal part of the fossils, colored brown with organic matter. There are also real pockets of viscous bitumen, which liquefy under a slight increase of temperature. A closer examination of the cavity shows that it is the result of the destruction of an astræan polyp. Of the association of petroleum and fossils in the United States, an observation has been recorded by M. Daubrée, of petroleum occupying the cavities of fossils—orthoceratites, brachiopods and corals, as well as porous parts of the rock—in some of the beds of the Ohio Valley; and statements by MM. Fuchs and Launay, that "a remarkable characteristic of the Canadian oil is the profusion of remains of mollusks and crustaceans, with some traces of marine vegetation, which it contains. This is one of the most serious facts on which an organic origin is attributed to petroleum."

Of the occurrence of these hydrocarbons, including also natural gas, a review of all the theories and evidences leads us to the conclusion that stratified deposits of asphalt, bitumen and petroleum are found in the different countries of the globe, often associated with salt, gypsum, sulphate of iron and mineral springs. A considerable number of these deposits are asphaltic or petroleum-bearing basins, of greater or less richness, the working of which requires the boring of wells, or the excavation of galleries permitting a tolerably exact determination of the manner of occurrence of the substances. Nowhere do the works furnish any evidence of the existence of reservoirs or cavities comparable to the caverns of mountainous regions; but everywhere the hydrocarbons are in the state of impregnation or mixture with the rocks in which the workings are made. When they exist in a viscous or solid condition, there is reason for presuming that this state or manner of being is due to particular phenomena of concentration, operating at the moment of deposition or after it. The existence of veins or of eruptive beds, ancient or recent, is nowhere established in a certain and indisputable way, but it may be that fissures existing in the rocks have been filled, either from above or laterally, by a posterior displacement.

1. Abstract, *Popular Science Monthly.*

In attempting to account for the origin of the hydrocarbons, a distinction may be made between two states in which they present themselves, whether on the surface or in the depths of the soil. The initial state, or that of formation, is represented in the stratified beds, where a series of superposed layers is presented. The substance exists, impregnating the rock, and, more rarely, in viscous or solid bituminous masses. The second state, that of alteration or transformation, is met in the beds which have been modified by dislocations, posterior to the solidification of the matters which were deposited in a movable or plastic state. To these dislocations may be attributed the natural petroleum wells which have been known from antiquity, as well as the flows of viscous bitumen which in some regions become solid on exposure to the air.

The slow distillation of marine bodies may be likened, to a certain extent, to the processes of conservation of fossil wood in the bottoms of marshes, peat bogs, etc., under the mud. But while the absence of air is sufficient to assure the preservation of these, the presence of an entirely impermeable envelope is necessary to prevent complete decomposition into volatile gases such as takes place with all animals simply buried under water.

The presence or existence of natural springs of petroleum in the vicinity of mountainous regions is explained, not by dislocations of the ground, but by the fact that the formation of the reliefs is anterior to that of the mineral oil. Instead of regarding these springs as available as guides in researches, they should be regarded as signs of the approaching exhaustion of the arenaceous strata impregnated with oil; these reservoirs not being susceptible, like those of our springs, of being refilled, as the springs are being kept full of water by the penetration from the surface.

If, then, we put aside the eruptive process as not well founded, it follows that the search for petroleum should be made with account taken of the conditions of formation of the sedimentary beds, of the extension of the basins in which they are deposited, and of the formations over them.

While the natural hydrocarbons are indisputably found in the sedimentary beds, from the most ancient to those which are still in process of formation, it is nevertheless certain that so far they are most extensive and most generally distributed in the Tertiary formations—excepting always the Silurian and Devonian deposits of North America, which were formed under geophysical conditions which have not yet been recognized in other regions where formations of the same age exist.

In a general way, the signs of the existence of solid, liquid, or gaseous hydrocarbons, exhibited by mud volcanoes, disengagements of natural gas, etc., authorize the presumption of beds near the surface, so that it is useless in such cases to anticipate a favorable result from deep borings.

All the facts noted by students of the natural hydrocarbons may be explained without difficulty under the hypothesis of the organic origin of the natural hydrocarbons, which becomes a complete system, the value of which imposes itself upon every one seeking the solution of the question. All is easy of conception if we suppose a simultaneous precipitation of mineral matters and organic substances derived from the decomposition of animals and plants, when these are found in suitable conditions of the medium and of their own being at the moment they are buried. But all becomes obscure and inexplicable under the hypothesis that these substances are formed in the depths of the globe under the influence of a high temperature and considerable pressure.

Comparative Cost of English and American Boilers.

Engineering News reports having received some data from Mr. George L. Rockwood, M. Am. Society Mining Engineers, of Worcester, Mass., who has recently returned from a three months' visit to Europe, concerning the relative prices of steam boilers in England and in the United States, which are of interest as illustrating the wide difference in the practice of the two countries. Comparing the ordinary horizontal fire tube externally fired boiler, which is most common in this country but is almost unknown in England, with the Lancashire internally fired boiler, which is the old-time English favorite, but is not used at all in this country, Mr. Rockwood says:

In Worcester or Boston the price, for instance, of a 72-inch × 20-foot horizontal return tubular fire tube boiler, f.o.b. cars, with all fixtures, is $1,000. This boiler has about 2,000 square feet of heating surface, giving, at 12 square feet allowed for 1 boiler horse power, a total of 166-horse power. $1,000 divided by 166 gives $6.25 as the cost per horse power. The price of a 66-inch × 18-foot boiler, f.o.b. cars, with all fixtures, is $800. This boiler has about 1,550 square feet heating surface, or 130-horse power. $800 divided by 130 gives again $6.25 as the cost per horse power.

These boilers are made to first-class specifications, having ¼-inch shells of best firebox steel, triple riveted buttstrap joints, with rivet holes drilled. They are guaranteed "drop dry" at 225 pounds water pressure, and to withstand a working pressure of 150 pounds steam all their lives.

Now the price quoted me for the 8 feet diameter × 30 feet length Lancashire boiler was 20 per cent. and 2½ per cent. off from £585 [(585 — 117) — 11.7] = £456.3. Calling £1 $4.90 in round numbers, gives $2,235, f.o.b. cars, as the cost of the Lancashire boiler in American money. The total heating surface is 1,080 square feet, which makes the boiler cost $2.07 per square foot as compared with 52 cents a square foot for each of the two American boilers; thus the Lancashire boiler is about four times as expensive per square foot of heating surface. But, on the other hand, the heating surface of the English boiler is more effective than it is in the return tubular boiler; not only because the Lancashire firebox is inside instead of outside the shell, but also because of the higher temperature at which the flue gases escape.

The claim is made that the English boiler will evaporate economically 6,500 pounds of water from and at 212° per hour, the maximum evaporation being 8,000 pounds. Taking 8,000 pounds = 230 boiler horse power gives 2,235 ÷ 230 = $9.75 as the cost per horse power. If we take the maximum power of the 66-inch × 18-foot boiler as 175-horse power (obtained with a combustion of 18 pounds of coal per square foot of grate per hour), then the comparative cost of the American boiler is less than half that of the English type. Whether the Lancashire boiler could be made in the United States at a price less than it can be purchased for now in England is an open question, as we have no data or experience from which to form an opinion; it seems to me not impossible, as the prices of all steam goods in this country are so much depressed by the severe domestic competition which has developed at a rapid rate within a comparatively recent period.

The only internally fired boiler which is used much in the factories of the United States—the Manning type—is still much cheaper than the Lancashire boiler, costing but $7.70 per horse power, when built for the highest pressures, and requiring no brickwork. The item of brickwork should also be considered in estimating the comparative cost of the return tubular and Lancashire boilers. On account of the great weight per horse power of the Lancashire when filled with water, and also on account of its great length, 30 feet, it is necessary to provide much deeper and better foundations for it than we provide for the American type, and in addition, separate brick return flues must be used for the Lancashire, as it is not economical to operate the boiler without the use of an economizer. The reason for this appears when one takes into account the relative cost of the heating surface in the Lancashire boiler and in the Green economizer. The cost of the economizer, all erected ready to be operated except for the brick setting, is 30 shillings per tube, $7.35. This makes the cost per square foot of heating surface 73 cents, as the tubes are 4 inches diameter × 10 feet long, and thus have about 10 square feet of surface per tube. As the heating surface in the boiler costs 8.4 shillings, or $2.07 per foot, whereas that in the economizer costs 3 shillings or 73 cents per foot, it is plainly to the advantage of the Englishman to buy as much economizer and as little boiler as he can use. The dividing line comes in at about the middle of the whole amount of surface needed; that is, the economizer is given the same number of square feet of heating surface as is provided in the boiler.

In this country the economizer costs something more than double the cost of the boiler per square foot of heating surface, and is, therefore, of more specialized utility than must be the case in England.

It should be said that brickwork is done far cheaper in England than in the United States, a "one hundred yards" chimney costing less than half what we should pay. The same ratio of cost obtains, of course, in brick boiler settings.

To further exemplify Mr. Rockwood's comparison we may compare the combination of the Lancashire boiler and its economizer, which will evaporate economically 6,500 pounds of water per hour from and at 212°, with an American tubular boiler designed to do the same work without an economizer, 1-horse power being taken at 34½ pounds evaporation per hour from and at 212°, and American practice giving 12 square feet of heating surface per horse power. This gives an evaporation of 2.875 pounds per square foot of heating surface per hour.

The American boiler would, therefore, have 6,500 ÷ 2.875 = 2,295 square feet of heating surface, which would ordinarily be furnished in two boilers. At the price given by Mr. Rockwood, 52 cents per square

foot, this would cost $2,295 × $0.52 = $1,193. The English boiler for the same service would have 1,080 square feet, costing $2,235. But the English boiler, in order to operate economically, needs to be provided with an economizer. The heating surface of the required economizer is equal to that of the boiler, or 1,080 square feet, at 3 shillings or 73 cents a foot, equals $788, which, added to $2,235, gives $3,023 as the cost of the boiler and economizer without brickwork, or nearly three times the cost of the American boilers.

As to the relative economy of fuel of the two systems, there is probably little difference. The American boiler, when run at an economical rate of less than 3 pounds evaporation per square foot of heating surface, will discharge its gases at about 400° F. The Lancashire boiler will discharge them at 800° or 900°, and the economizer will, when it is kept clean, reduce them to 300°—an advantage of 100° in favor of the English system. The English system undoubtedly has the advantage on the points of safety and durability, and it is a characteristic of the Englishman that he is willing to pay a good round price for what he considers the best article, while the American is apt to consider first cost as the prime consideration.

Power Transmission from Niagara Falls.

By Mr. Orrin E. Dunlap, in *Cassier's Magazine.*

At midnight on November 14, connection was made at the main power house of the Niagara Falls Power Company at Niagara Falls, between the famous Niagara generators and the transformers in the nearby transformer house, which, in turn, were connected with the city of Buffalo power transmission line, and at the same instant the electric power of Niagara was, for the first time, sent out beyond the confines of its birthplace and on direct to Buffalo, a distance of twenty odd miles. The power is used on the lines of the Buffalo Street Rail way Company.

The three-phase system of transmission is used, and as the line is not quite direct and as there are three cables, their combined length is about 78 miles.

It is recognized that this power line is destined to eclipse all others, owing to the market available for the power, and because the amount of power developed, and to be developed, will be an incentive to add to its capacity. The Niagara Falls Power Company are fortunate in more ways than one. Their plant has a practically unlimited water supply by which many thousands of horse power can be developed, and in addition to this their power house is situated in a section of country where there is a great demand for power. The possibility of such wonderful power development is one factor of importance, while the extended demand for their product is another which gives encouragement to the capital invested to accomplish things far beyond what man has ever before attempted.

In the construction of the Niagara-Buffalo line the Power Company have been governed by their rule to build the best possible work, and for this reason the line is a good example of strength and careful engineering. In no part has any known weakness been allowed to creep in, but in all the contracts the demand has been for perfect material and perfect construction.

The electrical equipment necessary for the transmission of power to Buffalo was furnished by the General Electric Company, of New York, and comprises, among other things, three air blast transformers with blower motor, switchboards, etc. Any two of these transformers can be used to transform 2,500-horse power in quarter-phase currents at 2,200 volts, to three-phase currents at either 11,000 or 22,000 volts. The third transformer will be held in reserve, all being interchangeable. The primary and secondary connections of these transformers are each led to a switchboard. The low tension board is fitted with switches and fuses; the high tension board is fitted with switches, fuses and indicators. Lightning arresters are also provided where the conductors leave the transformer house.

The transformers are supported on an iron framework, their bases being 8 feet below the floor of the transformer house, and the space below them being practically an airtight enclosure. It is through this enclosure that all connections to the transformers are made, there being ample room for walking about. The connections to the transformers themselves are made so that they can be easily detached, and in case it is found necessary or desirable to substitute the extra transformer for one of those in use, the existing connections can quickly be broken and the transformer removed with the crane in the building, and the extra transformer set in its place.

A large blower, which stands in one corner of the room, and is driven by a 5-horse power electric motor, delivers air to the enclosure below the transformers and this air passes upward through the spaces between the coils. The amount of air delivered is controlled by valves.

The arrangement of coils is such that exceedingly strong insulation will have to be punctured before connection can be made between different coils. At the same time, the air spaces are so placed that the air is brought in close contact with each coil and gives an excellent cooling effect. Naturally, this method of cooling tends to increase the size of the transformers, but it has the advantage of making them clean and accessible, and more convenient to handle.

The Cataract Power and Conduit Company, of Buffalo, was incorporated in July, 1896, for the purpose of becoming the distributing agents of Niagara power in the city of Buffalo. It has George Urban, Jr., as President; Charles R. Huntley as Vice-President and General Manager; William B. Rankine as Secretary and Treasurer, while E. D. Adams, Francis Lynde Stetson, D. Ogden Mills, John Jacob Astor, E. A. Wickes and Daniel O'Day are on the Board of Directors.

Under the contract made with this Company by the General Electric Company, of New York, four 360-horse power transformers were furnished for reducing the current as it comes from the transmission line to a voltage suitable for connection to 500-volt rotary converters. A special building was erected in connection with the Buffalo Street Railway Company's plant for these transformers at the Buffalo end of the line. The method of cooling and the general construction are very similar to that used in the large transformers at Niagara Falls. This building is also provided with lightning arresters and a switchboard.

It was with the Buffalo Street Railway Company that the General Electric Company made still another contract, and to them they furnished two 500-horse power rotary converters with switchboards and accompanying instruments. These converters will supply current to the lines of the Buffalo Street Railway Company in parallel with the generators now in their power house. The machines have six poles and operate at a speed of 500 revolutions per minute. They are so installed as to make it possible to start them either from the alternating current, or by direct current from the lines to which they are connected.

It is probable that no pole line was ever better constructed than that from Niagara Falls to Buffalo. Work was commenced on August 14, 1896, and on November 14 the line was turned over to the Cataract Construction Company, practically finished. In this period the poles had been obtained, set, painted, and the insulators placed and cables strung. In height the poles vary from 35 to 65 feet. They are all of white cedar and are shaved. They are set from 60 to 75 feet apart, the distance being varied in order to overcome any possible vibration of the spans during the high winds which frequently prevail in that locality. All the poles are painted with two coats of pure white lead and boiled linseed oil.

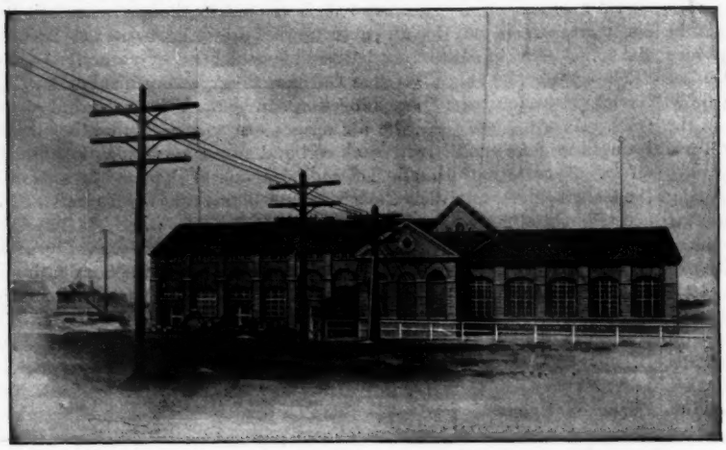
In turning sharp angles, as at corners, six poles are used instead of three, and these are braced by poles extending from the bottom of the opposite poles, as will be seen by the illustration on page 48. Where the double pole construction is employed, double cross arms are also used. These double cross arms are 24 feet long and measure 6 x 12 inches.

All single poles have three cross arms, the two upper arms being used for power cables and the lower arm to carry a telephone wire. The upper cross arms are of the same size, 12 feet long by 4¼ x 5¼ inches, and are of yellow pine. They are supported by solid braces of 2 x 2 inch angle iron. The lower cross arms are 6 feet long by 3¼ x 4¼ inches, and are supported by 1¼ x ¼ inch angle iron braces.

All the cross arms are staggered, and the gains are painted before the arms are set. The upper cross arms carry pins on which a line of galvanized iron fence wire is strung as a lightning protector, and another line of this wire is strung along the apex of the poles for a similar purpose. These lightning protectors are grounded at frequent intervals along the pole line. The pinholes in the cross arms have a depth of 4 inches, and all have drainage holes. The pins were not nailed in position until after the insulators were placed.

Two styles of insulators are in use on the line—one made by the General Electric Company, and one by the Imperial Porcelain Works, of Trenton, N. J. This latter insulator is known as the "Niagara type." In shape it is oval, and it has a projecting rim around the bottom to aid in throwing off water. This insulator is nearly as large as a derby hat, and of goodly weight. The other insulator is round in shape.

In the transmission, transposition is effected every five miles, and at these points two poles five feet higher than the adjoining poles are placed. The cable strung on the pole line is one of bare copper having 19 strands.

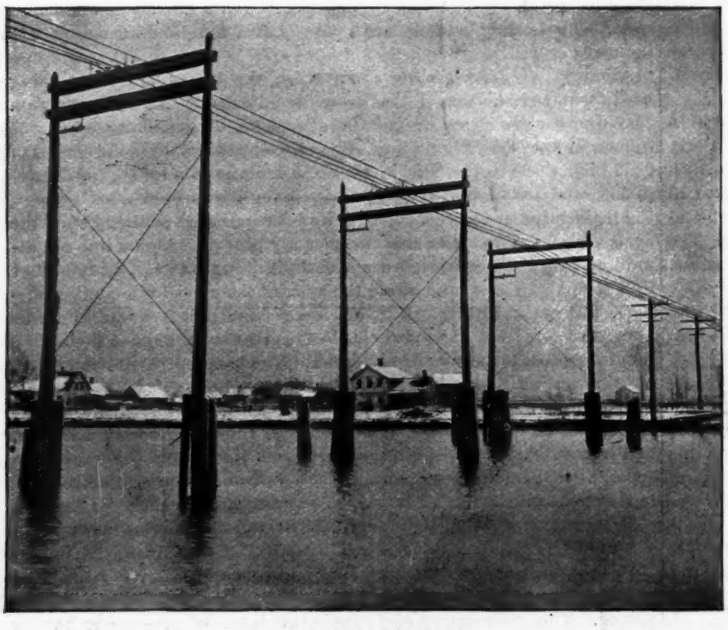


The Buffalo Electric Transmission Line Leaving the Transformer House at Niagara Falls.

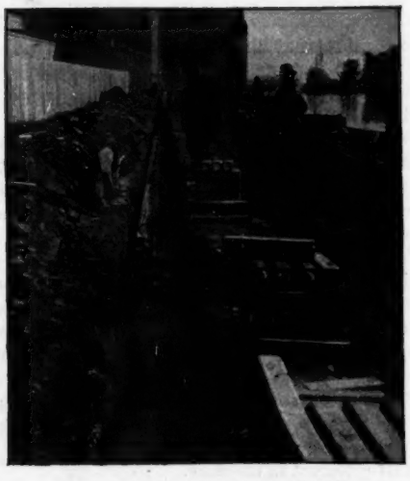
Turning a Corner.

The Buffalo Street Railway Company's Plant. The Destination of the First Niagara Power Sent to Buffalo.

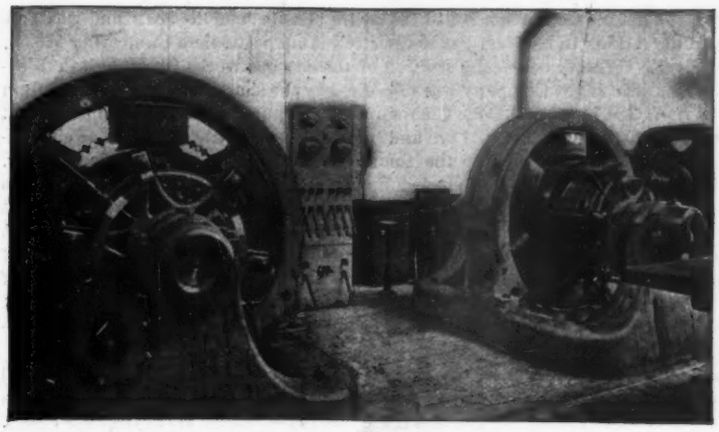
The Step-Up Transformers at Niagara Falls.



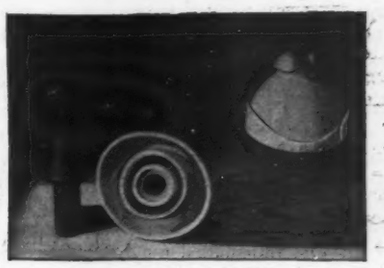
Crossing a Creek along the Line.



An Open Section of the Conduit at Buffalo.



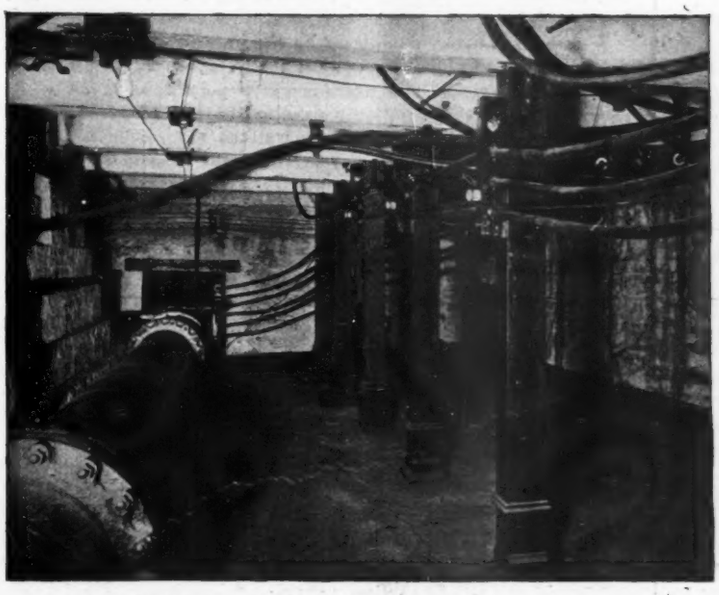
The Rotary Converters in the Dynamo Room of the Buffalo Power House.



The "Niagara Type" Insulator.

In the Step-Down Transformer House at Buffalo.

The General Electric Company's Double-Petticoated Insulator.



Three-Phase Circuits from the Step-Down Transformers to the Rotary Converters.

About 75 miles of this are used in the three lines, forming one three-phase system. The cable was shipped to the work on large reels, each carrying about a half-mile length. These reels were loaded on to a reel cart, and horses drew this heavy load along the line as the cable was paid out, a simple movement of a lever bringing the cable up taut on the arms.

At the Buffalo end of the line, for about 4,200 feet, the cables are laid in a conduit made of 12 vitrified tile ducts, each of which has a diameter of 3 inches in the clear. These tiles are laid in concrete with 4 inches as the minimum protection on all sides. The trench to accommodate them was excavated to a depth of about 40 inches, but this was governed by the locality. The average depth of soil over the conduit is 18 inches. The conduit is laid along the Erie Canal bank, but in no place does it approach the edge nearer than 14 feet, holding close to the 16-foot mark on the inside line. About 16 manholes, octagonal in shape, are located along the conduit. They are surrounded by a brick wall 12 inches thick, the bottom being formed by 6 inches of concrete and one layer of brick.

The terminal of the pole line at Buffalo is a brick house, 22 feet high, and its interior dimensions are 16 x 9 feet. A short tunnel leads from the last manhole in the conduit to the house. The cable laid in the conduit aggregates 12,345 feet in length for the three circuits. The rubber insulation is $\frac{3}{32}$ inch thick and is covered with rubber tape. The lead sheath is $\frac{1}{64}$ inch thick. Samples of the cable have withstood 40,000 volts successively.

The cable, after entering the terminal house through the short tunnel above referred to, is carried up inside on a trestle and the ends are sealed. A rubber insulated cable without lead is carried out to the first pole, and there connected with the bare copper cable of the pole line. The terminal house is fitted with lightning protectors.

It is already apparent that the transmission line is to be an impor-

tant factor in building up the section of country between Niagara Falls and Buffalo. For about 18 miles of the distance to Buffalo the transmission line runs through private property, the right of way over which was purchased by the Niagara Falls Power Company. This strip of land is 30 feet wide, and in the construction of this first line the poles have been set to the east side of the center, the outside boundary of the strip being 1 foot beyond the outside end of the large cross arms. This method was adopted so that another line can be constructed along the west side of the strip when occasion demands. The ownership of the land also makes it possible for the owners of the line to pass along it without trespass, and affords them excellent facilities for guarding it. The poles are set at a depth of from 6 to 8 feet, and where soft soil was met they were set in concrete.

Power was first transmitted over the line early on the morning of Monday, November 16. In the power house at Niagara Falls Mr. William B. Rankine, secretary of the Niagara Falls Power Company, threw the feeder switch and this let the current pass from the house to the transformer room adjoining. Beside Mr. Rankine, when he did this memorable act, stood Paul M. Lincoln, electrical superintendent of the power plant, and Mr. William A. Brackenridge, resident engineer of the Cataract Construction Company, under whose personal supervision the transmission line had been constructed and the electrical equipment installed.

Over in the transformer house was Mr. I. R. Edmonds, of the General Electric Company, who threw the low tension and high tension switches of the installation there, letting the current pass into and through the transformers and out over the line to Buffalo, where it was successfully received, and its arrival heralded by the booming of cannon, even though the hour was midnight.

At the Buffalo end of the line there was a notable gathering of prominent men, Mr. W. L. R. Emmet, of the General Electric Company, was in charge of the apparatus on behalf of his company. The mayor of Buffalo, leading editors and officers of the Cataract Power and Conduit Company and the Buffalo Street Railway Company were also there to welcome the coming of Niagara energy.

The product of the big generators at the Falls is now being daily transmitted to Buffalo at a voltage of 11,000, and 1,000 horse power is being used in that city for the propulsion of trolley cars.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Something about Municipal Control as Practiced in Hamilton, Ohio.

HAMILTON, OHIO, January 2, 1897.

To the Editors AMERICAN GAS LIGHT JOURNAL: I take the liberty of sending you under separate cover a copy of the Hamilton *Republican*, in which you will find an account of the present status of the city's electric lighting plant, which ceased lighting the streets this evening. The paper also contains a *resumè* of the condition of the municipal plants of Hamilton, as furnished by the City Clerk, Mr. M. O. Burns.

The operation and competition of municipal and private plants are matters of vital interest to every gas man, especially in Ohio. The contest between the municipal gas plant at Hamilton, Ohio, and the Hamilton Gas Light and Coke Company, has been carried on since 1889, in which year, as you will remember, the city owned a gas works which cost $150,000 to build, and $10,000 additional to start. The selling price of gas was fixed at $1 per 1,000 cubic feet, with a penalty of 10 cents per 1,000 if bills were not paid in 5 days. The Hamilton Gas Light and Coke Company made a rate of $1 per 1,000, with 5 cents off for prompt payment, or a net rate of 95 cents per 1,000. These rates remained operative until October, 1895, when notice was issued that the city would reduce the price to 80 cents per 1,000, the reduction to go into effect the following November. As the private Company had more than held its own during the six years, no cut was made below the new rate instituted by the city, so that 80 cents per 1,000 is charged by both Companies—they probably have a combined private consumption of about fifty millions. This is, of course, a very low price for such a town (population about 22,000), and accounts for the very large per capita consumption. The Gas Trustees have paid no interest or taxes, and have, after 6 years of operation, a surplus over operating expenses of about $13,000 (according to City Clerk's interview), or a profit (out of which to pay $7,500 interest charges) of about $2,000 per year on an investment of $160,000, or a net loss of $5,500 per year.

The Hamilton Gas Light and Coke Company has a larger sendout to-day than when it had the entire private field to itself and was supplying in addition gas to the city's lamp posts, then numbering 548.

Shortly before the erection of the city gas works the Hamilton Electric Light Company was organized by the shareholders of the Hamilton Gas Light and Coke Company, for the purpose of furnishing current to ordinary users of arc and incandescent electric lamps. The city, being unable to bear the thought of a monopoly in electric lighting, erected (in 1895) an electric light plant, at a cost of about $105,000, to supply the city with 210 arc lamps for its streets, and to furnish current for incandescent lamps to ordinary consumers. The Hamilton Electric Light Company was selling its product at $5 per month for arcs of 1,200-candle power, running from dusk to 12:15 A.M., or a schedule of about 2,500 hours per year; 16-candle power incandescents were sold at $1 per month each, on the same schedule—the Company furnishing renewals, and all necessary wiring for both circuits, free.

In order to meet this rate the city made a price of 12 cents per 1,000 watt hours, after giving current, to anyone who would wire up at his own expense, for the first three months—October 1st to December 30th, 1895. This price, however, failing to secure customers, the rate was reduced to 8 cents, where it now remains; but so far the receipts of the Hamilton Electric Light Company have not been appreciably affected. No better example of the fallacy of municipal ownership could perhaps be adduced. -Yours truly, DOUBTER.

The following is the matter referred to by our correspondent, which appeared in the issue of the Hamilton *Republican* for December 31st:

City Clerk M. O. Burns to-day submitted to the following interview relative to the situation regarding the electric light plant and the order to discontinue arc lighting by reason of no funds. Mr. Burns goes into details as to the condition of the city and his interview is the most comprehensive statement yet submitted to the people. He said:

"The threat of the Gas Trustees to shut down the electric light plant the first of the year demands some attention from the citizens of Hamilton. It is not assumed that the action of the Gas Trustees is caused by pique on their part, as much as to the fact they are out of funds.

"Hamilton of all the cities in the United States, has been most afflicted with the 'municipal ownership craze,' and now, having its fill on theory is reaping the result of 'biting-off' more than it can 'chaw,' and we must bear and grin as best we can under adverse circumstances.

"But in the condition that now confronts us we ought to try and inject a little common sense into the 'municipal cranium' and try and evolve some scheme whereby we can 'kite' along for the present and perhaps realize some of the fond expectations that were held out in the past. We are deluded in the belief that we have cheap water, gas and electric light, but when we add to these luxuries the fact that we have so raised the rate of municipal taxation until it has become burdensome, and then compare with other cities of our size we are not as well off as we think we are.

"We are taxed to pay the interest on the water works bonds as well as to provide for their redemption, but the water works is furnishing free water for municipal uses which is a great point in its favor, while on the other hand we are not only taxed to pay the interest of the gas works and the electric light plant, as well as to provide for the redemption of bonds, but we are also taxed for the purpose of 'lighting the corporation,' which is nothing more than double taxation. This is a curious situation, but is nevertheless true.

"While the water works tax levy is up to the limit, it fails to pay the interest and bonds falling due, and the same may be said of the gas and electric light levy, for they also barely pay the interest charges, with no bonds yet falling due. When they do commence to fall due, how they are going to be paid is a serious question. We should realize that the annual interest charge for water works is $15,500; gas works, $7,500, and electric light, $5,000, making a total of $28,000, with $10,000 of water works bonds falling due each year, making a total charge of $38,000, which must be paid annually, and as no assistance is rendered by either of said plants in helping to pay said charges it looks like the city is carrying a heavy burden.

"This leads to a point where some attention should be paid to doing something that would in a measure help the city out of this dilemma.

"If these plants were owned by a private corporation, they would certainly be made to pay at least the fixed interest and bonded indebtedness charges or else go into liquidation.

"The city ought to be able to make them do the same as private individuals could do, and backed by the loyalty and patronage of its citizens, they at least ought to be able to pay, say the interest charges, amounting to $28,000 a year, and in doing this taxes could be reduced about $3 per thousand, and thus give the city a chance to make other improvements that have been neglected for want of funds. The city

has reached the condition that comes to every individual who reaches out beyond his means. Maturity comes and protest has been avoided during the past year by using heroic remedies. Refunding bonds as they fall due may be in the opinion of many good financiering, but that does not pay the debt or discharge the interest which creeps along just the same as the bonds fall due and which must be paid. Hamilton is being devoured whole by its interest charges. During the coming year the interest owing by the city will amount to the sum of $43,035, bonds falling due $48,000, or a total of $91,125, or nearly 90 per cent. of the entire revenue of the city will be necessary for meeting charges.

"If a little higher water, gas and electric light rate could lighten the rate of taxation, it should be tried, as the time has come for heroic measures. We have had theory long enough and we must meet the condition.

"This brings us down to the position assumed by the Gas Trustees in regard to the money they have on hand and which they refuse to use for the electric light plant. They ask for $15,000, and say if the people vote for the issue they will buy the bonds with the money they have on hand. In other words, they want to rob Peter to pay Paul. They want to compel the city to pay interest on its own money; they want to increase the bonded indebtedness of the city as well as the interest account.

"Their position is not well taken, however sincere they may try to appear to the public. If they have money to loan to the city they should do so and not ask the city to pay interest for it, as the city has never asked them to pay interest on the $15,000 loaned them to start their plant, or even pay the bonds as they fell due. If they have this surplus they should be compelled to pay it back into the fund of the city and then the city will give it to them again to run the electric plant.

"They claim they must pay the bonds as they fall due, but if they don't or can't, the city must. The water works did it once or twice and then failed and the city stepped in and took up the thread where it broke off."

"A special election advertising it, and selling and printing the bonds, will cost close on to $800, and it is very doubtful if the citizens will vote any more bonds, and this money, nearly a year's interest, would be thrown away.

"The Gas Trustees should use a little common-sense and come down from their high horse and this matter can be amicably adjusted.

"The Gas Trustees by law are charged with lighting the corporation, and they must do it. The electric light plant was built for the same purpose as the gas works, and the consolidation of the two plants makes them one in the eyes of the law, and the Trustees can't draw the line and make a fine hair distinction.

"To plunge the city in darkness at the present time would be dangerous to the security of the city, and some effort should be made to avert it, for it would be calamity to say the least."

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. JAMES M. LATTA, President of the Goshen (Ind.) Gas Light Company, died at his home in that city on the evening of December 26th. He was in his 66th year.

THE following letter explains itself:

THE SAN FRANCISCO GAS LIGHT COMPANY,
SAN FRANCISCO, CAL., Dec. 26, 1896.

To the Editors AMERICAN GAS LIGHT JOURNAL: In your issue of December 14, 1896, page 934, I find an article by Mr. E. H. Yorke, entitled "A Successful Method Devised for Dissipating Naphthaline Deposits." I have not the honor of Mr. Yorke's acquaintance, therefore I beg that I may be allowed to inform him through your columns that the sum and substance of his article appeared once before in the AMERICAN GAS LIGHT JOURNAL, a fact of which, I doubt not for an instant, he was unaware, and which in all probability was overlooked in the Editors' office.

In the JOURNAL dated August 12, 1895 (Vol. LXIII., No. 7) can be found the article to which I refer, in the form of an illustrated "Wrinkle," by Mr. E. C. Jones, given to the members of the Pacific Coast Gas Association, at their third annual meeting, held in San Francisco, as duly set forth in your official report.

That it was incorporated into the body of the "Wrinkles," or did not appear under a separate and distinct heading as a paper, or otherwise, is in all probability the reason why it failed to come under Mr. Yorke's observation.

I am prompted to bring this matter before you solely through motives of fairness and justice, both to our Association and Mr. Jones, its founder.—Yours truly, J. BRYANT GRIMWOOD.

THE following figures are from the report of Mr. W. P. Knowles, Superintendent of the Richmond (Va.) City Gas Works, covering the named operations for the year ended December 31, 1896: The total gas consumed amounted to 216,272,094 cubic feet. The maximum sendout occurred in December, when the output reached 25,126,866 cubic feet; the minimum output was in August, the output for which month was 11,884,770 cubic feet. The following quantities of material were used: Coal, 6,193 tons; coke, 3,715 tons (2,240 lbs.); oil, 768,034 gallons; lime, 2,480 bushels. The meters in use number 6,546; total street main mileage, 73 miles, and 1,434 feet. 208 service pipes were put in at the requests of new consumers, and 384 services were renewed on betterment account. During the year the 20-inch leading main was extended from Belvidere and Broad streets, West, to Lombardy street, a 10-inch lateral main was run from Broad street, south, down Lombardy street to Cary street, and a 10-inch lateral main, from Broad street, south, down Shafer street, through Cherry street to Cary street. The named mains were connected with all of the mains in the paralleling streets, as far south as Cary street. Superintendent Knowles says the main improvements resulted in great satisfaction to the consumers on the enlarged lines.

PAPERS incorporating the Columbus Gas Engine Company, with headquarters in Columbus, Ohio, have been filed by Messrs. John Helcher, William A. Pope, Lawrence J. Hickey, Charles R. Hess, John F. Fergus and James J. Walcutt. The capital is returned at $7,000.

THE regular semi-annual dividend of 4 per cent., by the Hartford City (Conn.) Gas Light Company, was made payable on the 2d inst.

THE works of the Frostburg (Md.) Gas Light Company were damaged by an explosion, on the morning of the 1st inst. The loss is put at $300.

WE understand that the purchasers of the New London (Conn.) Gas Light Company's properties have also taken over the electric light plant of the Oneco Manufacturing Company, which means that both will hereafter be operated in harmony.

THE proprietors of the Chuctanunda Gas Light Company, of Amsterdam, N. Y., have reduced the net selling rate for an illuminating supply to $1.50 per 1,000 cubic feet.

THE Hartford City (Conn.) Gas Light Company is now distributing gas from the new holder. The connections were made on New Year's day.

THE Des Moines (Iowa) *Leader* says that the Capital City Gas Light Company, of Des Moines, will lay about 10 miles of new mains during 1897. The Company has just finished the placing of 8 miles, making a total of something over 50 miles in operation. The new extensions will be in University Place, North Des Moines, in Capital Park and on Pennsylvania avenue. It is also possible that mains will be laid in the adjoining districts of South Des Moines and Sevastopol. Manager Pratt, in response to a question from a reporter as to the trade enjoyed by the Company, said: "We have found that since prices were reduced and new extensions completed many persons whom we never expected to be consumers of gas are taking it from us both for fuel and light. Many of our subscribers are persons who have incomes of from $40 to $60 a month, and who find gas is cheaper at present rates than other means of illumination, or than other forms of fuel. We expect to largely increase the output of gas for fuel purposes during the coming year along the new extensions."

ADVICES from Waltham, Mass., are to the effect that, on the evening of December 28th, the Board of Aldermen negatived the proposition to purchase the plant of the local Gas Company, for operation on municipal account. The Board of 1895 voted to buy the plant, and the vote last taken was the second one necessary before the question could be submitted to a ballot by the taxpayers. Early in 1896 a special committee was appointed to take up the matter where it had been left by the previous Board; and one of the duties imposed on this committee was to procure a schedule of the plant and a price for the same from the Company at which it would be willing to sell. The committee failed

to get the schedule, and this failure, in a measure at least, caused the adverse action of the Board. There was an animated discussion over the resolution introduced by the committee, which favored the purchase of the plant, but when the vote was announced it was found that 10 voted against the proposition, while 7 favored it. This overturns the whole scheme, for if the Board of 1897 deems the purchase of the plant advisable, the work will have to be begun all over again, as the law distinctly states that the matter must be adopted by two successive Boards and approved twice by the chief executive before submission to the people for acceptance or rejection.

SUPERINTENDENT JENNINGS, of the Framingham (Mass.) Gas, Fuel and Power Company, reports that the output is steadily increasing, many new consumers having been put on the lines since December.

THE Western Gas Governor Company, with headquarters at Cleveland, Ohio, has been incorporated by Messrs. O. L. Sadler, Louis B. Wilhelm, Carl Horix, Louis Hoffman and W. E. Boje. It is capitalized in $10,000.

THE St. Louis *Post-Dispatch* says that judgment has been entered against the Laclede Gas Light Company in the suit brought against that corporation by the city to enforce the payment of 5 per cent. required by ordinance on the gross receipts in excess of the amount of its contract for city lighting. The case has been pending in Judge Klein's court, and the judgment rendered was for $7,162.45, which is 5 per cent. of $130,600.99, the excess of gross earnings for one year, with interest added, for the time the Company has witheld payment.

THE managers of the municipal gas plant at Wheeling, West Va., are congratulating themselves over the fact that the operation of the plant for 1896 resulted in only a "trifling deficit." The deficit for 1895 was not far from $15,000.

THE Common Council of Philadelphia, in considering the budget recommendations for the Board of Public Works for 1897, as submitted by the Finance Committee, restored the salary of Mr. A. J. McCleary, Assistant to the Chief of the Bureau of Gas, to the original figure—$3,000 per annum. The Finance Committee recommended that Mr. McCleary's compensation be fixed at $1,500.

THE authorities of Beverly, Mass., are inclined to investigate the matter of carrying on the public lighting for municipal account.

THE new executive management of the New London (Conn.) Gas Light Company is as follows: President, George E. Terry; Secretary, A. M. Young; Treasurer, A. J. Purinton.

THE Board of Public Safety, of Louisville, Ky., has confirmed the agreement made between Mr. Herman Lochner, acting as city buyer, and the Louisville Gas Company, under which the latter is to furnish to the Louisville fire department 8,000 bushels of crushed coke at the rate of 7½ cents per bushel. The Company also agreed to furnish any quantity of lump coke that may be demanded, at the rate of 7 cents per bushel.

A CORRESPONDENT forwards the following from Richmond, Va., under date of the 3d inst: "Two Companies, one of which was chartered in the Law and Equity Court on the 2d inst., and the other of which is now in process of formation, are anxious to secure control of the Richmond City Gas Works. At the session of the Common Council, to be held to-morrow night, both concerns will submit propositions to lease the plant. It is not contemplated, it is said by those connected with both Companies, to either increase the price of gas or to cut down the wages of those employed in the works. The Richmond Gas Company was granted a charter by Judge E. C. Minor yesterday, the object of which is to manufacture, distribute and sell gas in this city. The capital stock is to be not less than $50,000, nor more than $500,000, and among the Directors are Major Lewis Ginter, of Richmond, and Mr. Alten S. Miller, formerly of this city, but now the Engineer of the New York and East River Gas Company, of New York. The following is the full text of the charter granted by Judge Minor: 'To the Hon. E. C. Minor, Judge of the Law and Equity Court of the City of Richmond: The undersigned, desiring to form a joint stock Company, under the name and for the purposes hereinafter set forth, do make, sign and acknowledge, according to law, the following certificate:

"'1. The name of the Company shall be the Richmond Gas Company.

"'2. The purposes for which said Company is formed are to buy, lease, establish, maintain, operate, own and sell, or otherwise acquire and dispose of gas works and gas, and to furnish gas to persons or corporations; and to that end to construct and extend mains, pipes and all other works and structures necessary or convenient in the making or distributing of gas.

"'3. The capital stock of the said Company shall not be less than $50,000, nor more than $500,000, to be divided into shares of $100 each. Said stock shall be divided into two classes—that is, there shall be preferred stock and common stock. The preferred stock shall be entitled to a dividend not exceeding 6 per cent. per annum out of the Company's net earnings, and the holders of said preferred stock shall not be entitled to any vote in any stockholders' meeting. The amount of preferred stock to be issued shall never exceed one-half of the total number of all stock actually issued.

"'4. The amount of real estate proposed to be held by said Company shall not at any one time exceed 50 acres.

"'5. The principal office of the said Company shall be in the city of Richmond, Va.

"'6. The chief business to be transacted by the Company is that of buying, making and selling gas for lighting, fuel and other uses.

"'7. The names and residences of the officers who for the first year are to manage the affairs of the Company are: Alten S. Miller, President, Richmond, Va.; Edward J. Willis, Secretary and Treasurer, Richmond, Va.; Directors, R. A. C. Smith, C. H. Dickey and George Arents, of New York city; and Lewis Ginter, Alten S. Miller, Edward J. Willis and P. B. Sheild, of Richmond, Va.'

"I could not ascertain who the gentlemen are that stand sponsors for the other Company, but the following communication, from Mr. Ware B. Gay, its representative, was received on the morning of the 2d inst., by Mr. James Caskie, President of the Common Council: 'Richmond, Va., January 1, 1897. Mr. James Caskie, President of City Council—Dear Sir: Parties I am associated with will submit a proposition relating to the lease or sale of the Richmond gas works, which will include the investment of upwards of $1,000,000, in addition to $1,000,000 or more I have already been the cause of bringing here.

"'The proposition will provide for gas at not over $1 per 1,000 cubic feet for illuminating purposes, and at 80 cents per 1,000 feet for domestic heating and cooking, and a discount of 30 cents per 1,000 for manufacturing purposes; it being intended to erect a plant equal to any in the whole world, and capable of practically affording industrial plants in Richmond and Manchester opportunities equal to those enjoyed in the natural gas sections, and much more reliable.

"'It may not be inappropriate to add that the bituminous coal now being mined and shipped from Gayton in large quantities is especially adapted for gas purposes, and that the output can be increased to 1,000 tons or more per day within six months. The full development of the Richmond coal field, with an industrial and consuming population at the mines, means the expenditure in Richmond of many thousands of dollars per day in purchases, and I may add that for over six years our purchases at wholesale have averaged over $300 per day, in addition to several thousands of dollars per month payroll, which eventually is largely expended here by the workmen and their families.

"'Again, we have had an effect upon the price of coal consumed here, and I have no hesitation in saying that the Gayton and Midlothian mines, since I have been associated with them, have saved the city of Richmond not less than $100,000 per year in the price of coal.

"'When this fact is realized, and what a fuller development of the Richmond coal field means for Richmond, it would seem that a local helpfulness and co-operation should be awakened, and make available the greatest kind of possibilities naturally belonging to Richmond and Manchester.—Yours truly, WARE B. GAY.'"

THE following is the decision of the Board of Gas and Electric Light Commissioners of Massachusetts, in respect of the disagreement between the Selectmen of Millbury and the Millbury Electric Company, as to the rate which should be paid for the public electric lighting of the town:

"Petition of the Selectmen of the town of Millbury—This was a petition of the Selectmen of the town of Millbury, praying for a reduction in price and improvement in quality of the electric street lights supplied by the Millbury Electric Company. A public hearing was given upon this complaint in the town of Millbury, at which the petitioners and the Company were represented by counsel. The street lights in the town

consist of 33 arc lights of nominal 1,200-candle power, and 6 series incandescent lights of 32-candle power, operated from the arc circuits upon a moonlight schedule until midnight. For these lights the town has annually appropriated the sum of $2,500, until the town meeting in the current year, when only $2,000 was appropriated. The Company declined to accept the offer by the Selectmen of the sum thus voted, and representatives of the town and the Company were unable to agree upon any arrangement which would reduce either the number of lights previously supplied or the price paid. After somewhat protracted negotiations, during a portion of which the lights were not in use, the Company offered to supply them at the annual rate appropriated by the town until this Board, upon petition of the Selectmen, should determine what was a fair price for the service, and thereafter at such price, and the Selectmen, having been authorized thereto by the town, brought this petition.

"The Millbury Electric Company was organized in 1888 and has ever since been engaged in the supply of electric lights for public and private use in the town of Millbury. Its first station was a small building upon land of its President, containing a small engine and an arc dynamo, and for this plant, with the street lines for arc lighting, it had issued, prior to October, 1889, $13,000 of the securities which are now outstanding. With this plant both arc and incandescent lights were operated from the same circuits, in accordance with the custom then prevailing in the smaller towns. In the following year this station was abandoned, and a new station of brick was erected upon land purchased by the Company, and in it the engine and dynamo were placed, boilers were erected, a new engine and dynamo were installed, and new circuits were run for incandescent lighting. For the purpose of this new construction the Company increased its securities by about $20,000, so that at the date of the hearing on the petition it has outstanding stock of the par value of $17,000 and bonds amounting to $16,000. Shortly after the close of the hearing the second station and steam plant were abandoned, and the dynamos were removed to the building of the Millbury Water Company, under a contract with that corporation for their operation for a term of years. There is no standard price for arc lamps of the class involved in this case, which is of universal application. Not only the number of lights and the hours run, but their relation to other parts of the Company's business are important factors. In reaching a decision, the Board has found it necessary to consider not only the street lights, but the Company's income from its entire business and the way in which its affairs are managed. Those who invest their money in order to render the public a service of this character are entitled to a reasonable return from the business when properly conducted, but are not entitled, for the sake of such return, to impose upon a community additional burdens on account of careless or incompetent management.

"With the price named the Company can expect a reasonable profit only after substantially improving its present methods and introducing new economies in the supply of private as well as public lights. Of the incandescent lights, those located in private residences are supplied by meter, those in stores and shops upon a contract system at a fixed monthly rental, with little regard to service rendered. A study of this part of the business, conducted steadily since the hearing, has clearly shown that the contract lights are supplied at little or no profit, probably, indeed, at a considerable loss, and that a readjustment of these rates at a substantial advance, or the supplying of this portion of the Company's output through meters, will be necessary, unless an undue share of the Company's income is to be derived from street and residence lighting. Since the hearing, the Company has concluded a contract with the Water Company for the operation of its dynamos, which is expected to make a substantial saving. This contract, however, has not been considered of importance in this case, since it must be regarded as entirely experimental; its success has not yet been demonstrated and is involved in serious doubt. The contract and the relocation of the Electric Company's dynamos are the result of a common ownership or control in the two corporations. The Companies can abrogate or modify it and may reasonably be expected to do so unless it prove profitable to both.

"The Company has never earned a dividend, although it has paid one or two, and the various changes and removals referred to have involved large losses, which have greatly reduced, if they have not wholly extinguished, the value of the stock. For these reasons, future dividends have been rendered exceedingly doubtful, and are not considered in the price hereinafter named. The effort of the Board has been to include in such a price a fair profit, sufficient only to bring a reasonable return upon the capital, which might fairly be required for a plant suited to a town of this size and character.

"The Board recommends that, from and after the date hereof, the price charged by the Millbury Electric Company for arc and incandescent lights now in use for street lighting, operated substantially the same number of hours per month as heretofore, shall be at a monthly rate, which shall produce for the whole fiscal year of the town not more than $2,375; added lights to be supplied, if no more than seven be required, at $44 per light per year, and if the number of lights shall be reduced, the reduction from the yearly amount named shall be at the rate of $14.50 for each lamp taken from the present number. A *pro rata* rebate based upon the number of lights and price paid, to be made for a total failure of service of said lights or any of them, and three incandescent lights to be considered the equivalent of one arc light in all computations. The question of the quality of the lights was also involved in the petition. Very little evidence was submitted upon this point, however, and that which was presented was so indefinite that the Board is unable to criticize the quality of the lights or provide for their improvement. No satisfactory tests have ever been made on behalf of the town, no record has been kept by the town of lamps not burning, and no data was presented upon this portion of the petition which could authorize the Board to make any finding whatever. The town authorities have it in their power without large expense to obtain data of this character, and its possession would materially aid in remedying any evils that might exist, while a knowledge by the Company of the town's purpose to procure it would alone be a strong inducement to render the best possible service. For the Board, by F. E. BARKER, Chairman."

Machinery Attached to the Soil.

A very interesting case (that of Hobson v. Gorringe) has just been settled in the English Court of Appeal that is of considerable importance to the increasing class of persons who let machinery, or sell it on the hire system. It was about a gas engine to which the Rev. Mr. Gorringe laid claim because it was "attached to the soil," he being the owner of the soil.

The facts are briefly as follows: The plaintiff, Hobson, let to a builder named King, upon the hire and purchase system, a gas engine for the purpose of being placed upon the latter's land at Worthing.

It was agreed that if King should fail to pay the hire, Hobson should be at liberty to repossess himself of the engine without claim, on any ground, from King. It was expressly stated "that the contract should not be construed to operate in any way as a contract for the sale of the gas engine, but only as an arrangement for the hire thereof, unless and until King should have paid all the installments." The engine was to drive a sawmill, and was held down to a concrete foundation by means of four bolts and nuts. King made a few payments and then stopped, so he certainly never became the owner of the gas engine. In the meantime he had mortgaged his land, together with buildings and fixed machinery and fixtures—there was other machinery besides the gas engine—to the gentleman who played the part of defendant. After this King took refuge from the financial troubles of life in the Bankruptcy Court, a haven of rest not infrequently sought by builders. At this juncture Mr. Hobson very naturally tried to repossess himself of his gas engine upon the ground, clearly set forth in the agreement, that it had never become King's, but had always remained a chattel belonging to him, Hobson, and therefore could not be a chattel of the mortgagee. Mr. Gorringe here joined issue, and was so far justified in his view of the law that he has been upheld by Mr. Justice Kekewich, whose reading of the law has been since confirmed by the Court of Appeal.

Now we have no doubt that this may be very good law, but it is certainly very poor justice. It is an elementary conception on the part of all people sufficiently intelligent to discern the difference between mine and thine, that a man cannot give away that which does not belong to him, or, in other words, that a good title cannot be founded on a bad one.

In the case of "the soil" we know, however, that fundamental canons of justice can be overset, and with what injustice to individuals the present case shows. It is on wider grounds, however, than of injustice to individuals that alteration of English law in this respect is demanded. The present state of affairs is a very serious clog on industry. A large quantity of machinery is now let or sold on the hire system, which is a perfectly legitimate method of doing business and of great help in facilitating industry. As the law stands, however, no owner is safe if his machinery is in any way fixed, and nothing that the ingenuity of lawyers can devise will render him secure.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

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WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.
PACIFIC COAST GAS ASSOCIATION.
TEXAS GAS AND ELECTRIC LIGHT ASSOCIATION.

MONDAY, JAN. 11, 1897.

The Market for Gas Securities.

City gas shares were dull and lower last week, mainly from fear of legislative interference with the gas rate. In fact, the Legislature had little more than been called to order, when "dollar gas bills" were introduced in the Assembly and the Senate. It looks to us just now that the special committee of the Board of Aldermen, charged with investigating the matter of the gas supply of New York, will not be much of a thorn after all; for our information (and it is well based) is that the Legislature will refuse to give it the necessary authorization to send for persons, books, etc. On the other hand, though, the Legislature may appoint a committee on its own account to carry on the "investigation." There is also a possibility that a graded 5-year schedule, beginning with a maximum of $1.25, will be the outcome of the present agitation.

It is too early in the dispute to attempt a prognostication that would be in the end true. The figures tell the story of how the market stands.

Bay State has been active, with fair strength; Lacledes are in better demand, and Chicago is strong enough to indicate that the dividend is all right. Brooklyn Union is weak but the Company's bonds are buoyant.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

JAN. 11.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	141	144
Central	500,000	50	175	205
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	193x	..
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	215	230
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
Northern	150,000	50	85	..
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	42	43
Preferred	2,000,000	100	72	73
Bonds 1st 5's	3,500,000	1,000	105	106
" 1st Con. 5's	1,500,000	..	94	96
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	80	81½
Preferred	5,000,000	100	100	103
Bonds, 1st Mortgage, 5's	1,500,000	1,000	103½	..
Yonkers	299,650	50	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	85	88
" " Bonds (5's)	15 000,000	1,000	106	106½
Bay State	5,000,000	50	11¼	12
" Income Bonds	2,000,000	1,000	..	35
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000		76
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co.	25,000,000	100	75⅝	75¼
Chicago Gas Lt. & Coke Co.				
Guaranteed Gold Bonds	7,650,000	1,000	94	94¼
Columbus	1,069,000	..	68	70
1st Mortgage	1,085,000	..	..	96
Consumers, Jersey City	2,000,000	100	70	75
" Bonds	600,000	1,000	100	102
Cincinnati G. & C. Co.	7,000,000	100	190x	200
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	1,000,000	100	60¾	61¼
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	..	19	25
" Con. Bonds	4,312,000	..	..	82
Equitable Gas & Fuel Co., Chicago, Bonds	2.000.000	1,000	..	101
Fort Wayne	2,000,000	..	82	86
" Bonds	2,000,000	..	85	90
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	128	133
" Bonds, 6's	2,650,000	..	103	105
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	84	88
Bonds	1,000,000	1,000	85	90
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	24	24½
Preferred	2,500,000	100	75	80
Bonds	9,084,400	1,000	93	..
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.	1,000,000	..	93	98
Bonds, 6's	4,000,000	..	123	..
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	53½	54
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Paterson, N. J.	.....	25	99	102
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	88	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10.000,000	100	97¾	98¼
St. Paul Gas Light Co.	1,500,000	100	67½	70
1st Mortgage, 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	..	88	90
Syracuse, N. Y.	500.000	25	..	..
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	63	65
Bonds, 5's	3,556,000	.	90	93
Wilmington, Del.	500,000	50	180	182

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., DREXEL BUILDING, PHILA., Dec. 21, 1896.

The Directors have this day declared a quarterly dividend of 2 per cent. ($1 per share), payable on Jan. 15, 1897, to stockholders of record at the close of business Dec. 31, 1896. Checks will be mailed.

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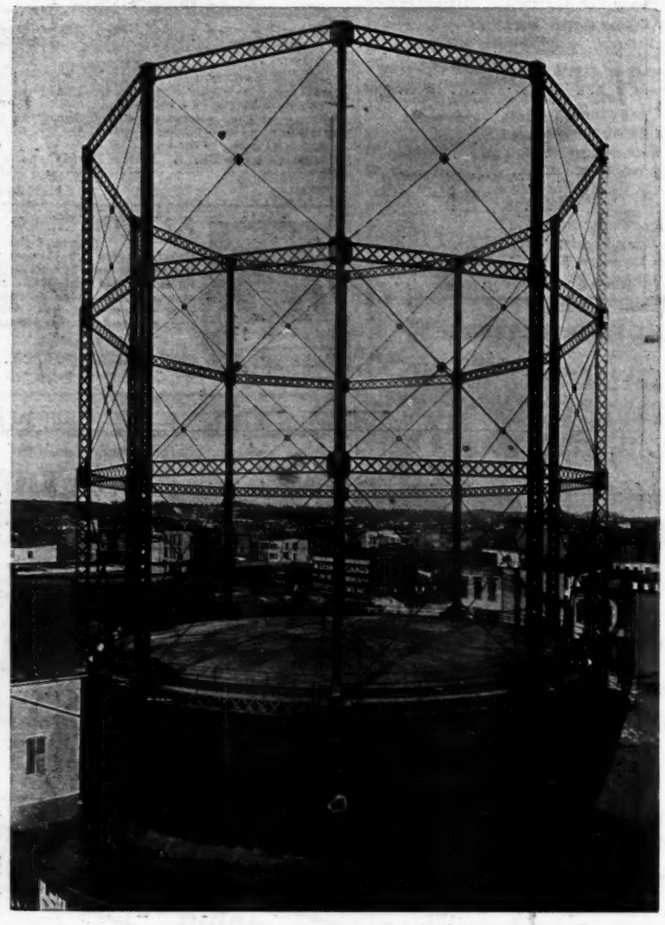

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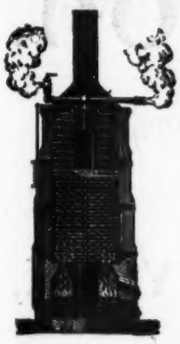

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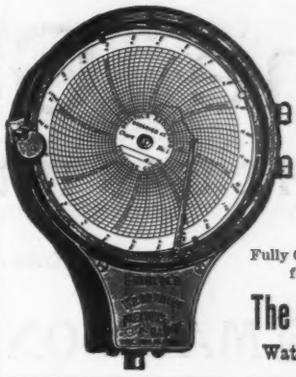

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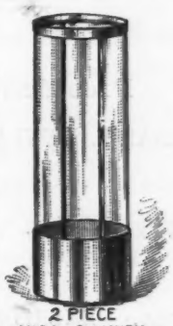

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C. J. R. HUMPHREYS, American Gas Lt. Asso. **C. H. NETTLETON, New England Asso. of Gas Engineers.**

Every indication points to the attendance of gas men from near by as well as from the most remote sections of the country. Arrangements are now under way for providing hotel and railway facilities for members of the gas fraternity who may wish to visit New York during the Exposition.

Several New York hotels have offered special rates.

Full particulars on these points will be given very shortly.

The Historical Exhibit will embrace many articles of surpassing interest. A celebrated collection of ancient lamps and lighting appliances, consisting of several hundred rare specimens never exhibited outside the great institution in which the collection is now lodged, is promised.

GAS MEN'S NIGHT.

The Ohio Gas Light Association will hold its annual meeting in this city during the Gas Exposition. Date, February 3 and 4. The management has designated Wednesday evening, February 3, as **Gas Men's Night.** A programme will be made up covering this feature that will appeal to all as befitting the occasion.

THE TIFFANY GAS TOWER,

With its Myriad of Lights and Beautiful Decorative Effects. Worth a Thousand Mile Journey to See.

INJUNCTION ISSUED AGAINST INFRINGERS.

On September 23d the United States Circuit Court for the Southern District of New York granted an injunction restraining and enjoining the further infringement of our Welsbach patent. READ IT.

UNITED STATES CIRCUIT COURT,
Southern District of New York.

WELSBACH LIGHT COMPANY,
vs.
A. LIEBES. } IN EQUITY.

The President of the United States,

TO A. LIEBES, and his servants, agents, attorneys and workmen, GREETING:

WHEREAS, It has been represented to us in our Circuit Court of the United States for the Second Circuit and Southern District of New York, that Letters Patent of the United States No. 438,125, were issued in due form of law on the 7th day of October, 1890, to Carl Auer von Welsbach, assignor of the complainant, then known as "Welsbach Incandescent Gas Light Company of New Jersey," and that the complainant herein is the owner of said Letters Patent, and that you, the said A. Liebes, have infringed the rights secured by the aforesaid Letters Patent, by making, using and selling to others to be used, incandescent devices for gas burners, embodying and containing the invention and improvements described and claimed in said Letters Patent No 438,125.

NOW, THEREFORE, We do strictly command and enjoin you, the said A. Liebes, and your attorneys, agents, servants and workmen, under the penalties which may fall upon you in case of disobedience, that you forthwith and forever desist from directly or indirectly making, or causing to be made, delivering, vending, or causing to be sold, offering for sale, using, or causing to be used in any manner, any incandescent devices for gas burners, like, or similar to those which you have heretofore made, used or sold, containing or embodying the invention and improvements described in said Letters Patent No. 438,125, and claimed in the claim thereof, and from counterfeiting or imitating the said invention or improvements or any part or parts thereof, and from in any manner or way whatsoever, violating or infringing the said Letters Patent No. 438,125 and the claim thereof, and from doing, or causing to be done, any other act or thing whatsoever in infringement of the said Letters Patent No. 438 125.

WITNESS, The Honorable Melville W. Fuller, Chief Justice of the United States, at the City of New York, in the Southern District of New York, this twenty-fourth day of September, A. D., 1896.

(SEAL) JOHN A. SHIELDS, Clerk.

(Endorsed) U. S. Circuit Court, Southern District of New York, in Equity.—Welsbach Light Company vs. A. Liebes. Injunction.

A Copy of a Writ of Injunction this day issued out of my office. JOHN A. SHIELDS, Clerk.

We shall proceed against all infringers; manufacturers, dealers and users being equally liable to injunction and damages. The decree of the court awarding the injunction also awards profits and damages. Do not be misled or deceived by guarantees offered by infringers, as such guarantees will not protect you against suit, injunction and damages. For your own protection see that you get the genuine Welsbach light. All other incandescent gas lights are infringements.

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Best in the World.

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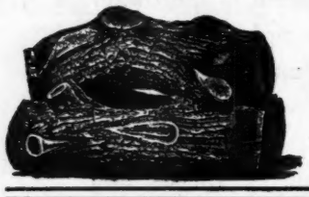

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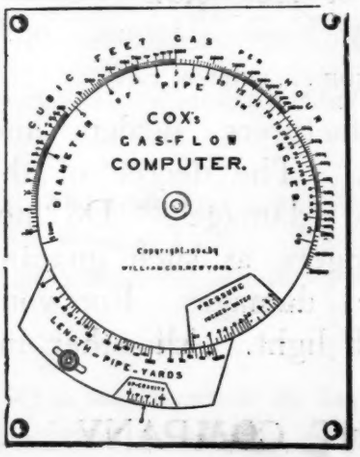

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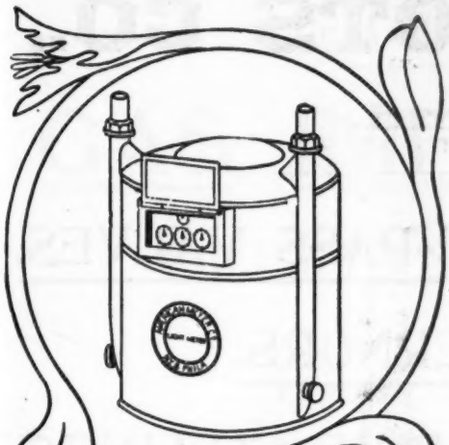

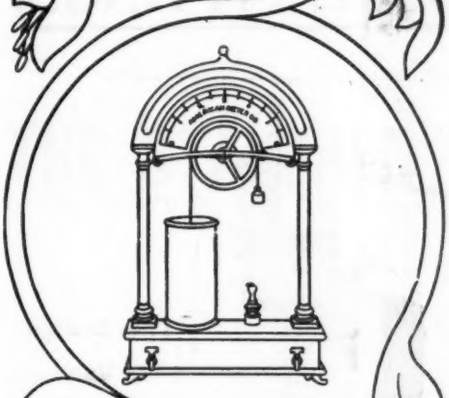

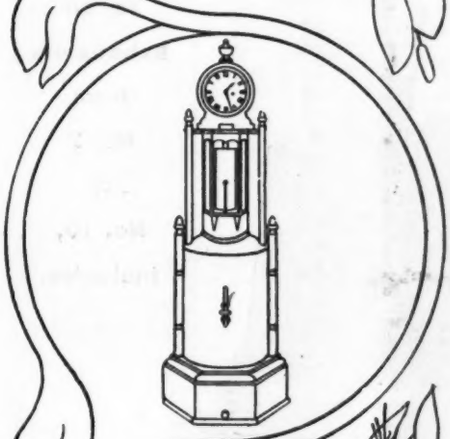

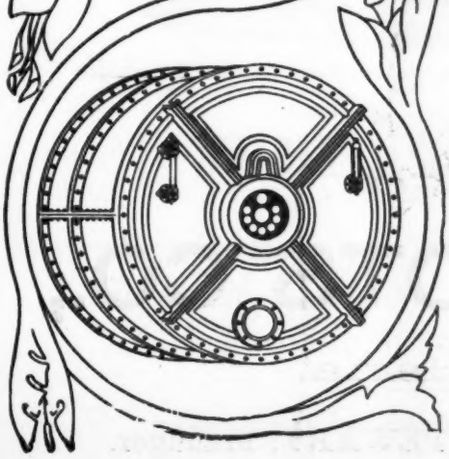

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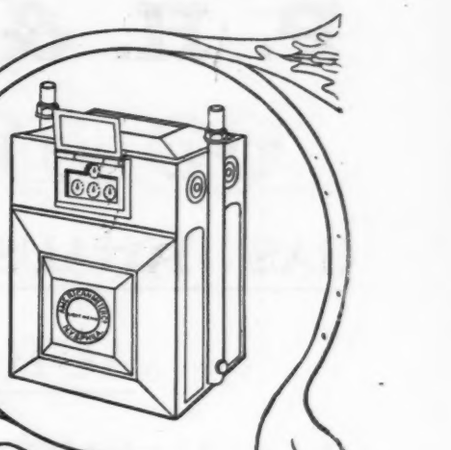
PUBLIC LIGHTING TABLE.

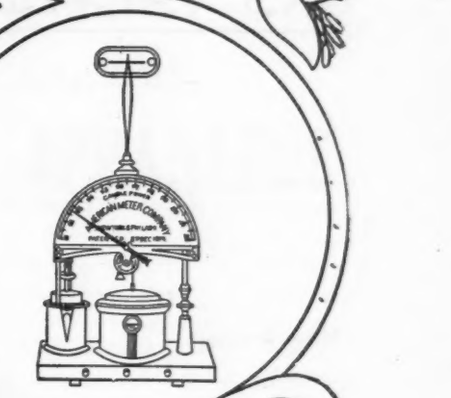
JANUARY, 1897.

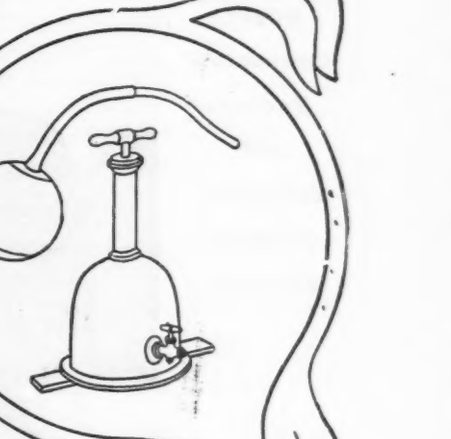
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Fri.	1	5.10 PM	6.20 AM	4.30	6.30
Sat.	2	5.10 NM	6.20	4.30	6.30
Sun.	3	5.20	6.20	4.30	6.30
Mon.	4	5.20	6.20	4.30	6.30
Tue.	5	5.20	6.20	4.30	6.30
Wed.	6	5.20	6.20	4.30	6.30
Thu.	7	8.50	6.20	4.30	6.30
Fri.	8	9.50	6.20	4.40	6.30
Sat.	9	10.50	6.20	4.40	6.30
Sun.	10	11.50 FQ	6.20	4.40	6.30
Mon.	11	12.50 AM	6.20	4.40	6.30
Tue.	12	1.50	6.20	4.40	6.30
Wed.	13	2.50	6.20	4.40	6.30
Thu.	14	3.50	6.20	4.40	6.30
Fri.	15	4.50	6.20	4.50	6.25
Sat.	16	5.40	6.20	4.50	6.25
Sun.	17	No L.	No L.	4.50	6.25
Mon.	18	No L. FM	No L.	4.50	6.25
Tue.	19	No L.	No L.	4.50	6.25
Wed.	20	5.40 PM	8.20 PM	4.50	6.25
Thu.	21	5.40	9.30	4.50	6.25
Fri.	22	5.40	10.40	5.00	6.25
Sat.	23	5.40	11.50	5.00	6.25
Sun.	24	5.40	1.10 AM	5.00	6.25
Mon.	25	5.40 LQ	2.20	5.00	6.25
Tue.	26	5.40	3.40	5.00	6.25
Wed.	27	5.40	4.50	5.00	6.25
Thu.	28	5.40	5.50	5.00	6.25
Fri.	29	5.40	6.10	5.05	6.15
Sat.	30	5.40	6.10	5.05	6.15
Sun.	31	5.50	6.10	5.05	6.15

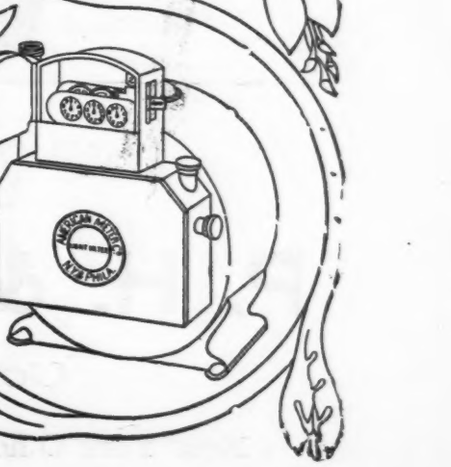
TOTAL HOURS LIGHTING DURING 1897.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	233.00	January	423.20
February	187.20	February	355.25
March	202.00	March	355.35
April	170.40	April	298.50
May	163.00	May	264.50
June	140.40	June	234.25
July	151.40	July	243.45
August	167.30	August	280.25
September	174.40	September	321.15
October	200.00	October	374.30
November	205.20	November	401.40
December	220.10	December	433.45
Total, yr.	2216.00	Total, yr.	3987.45









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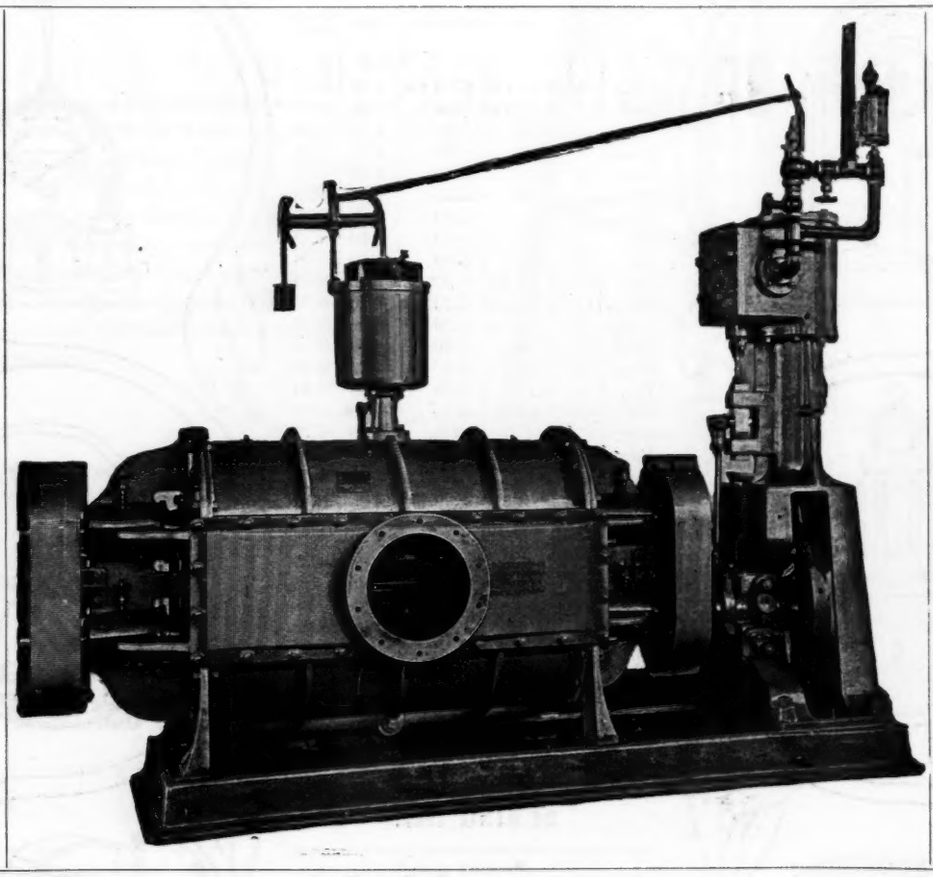

This Design is Used for all Exhausters from No. 7 to No. 10, Inclusive.

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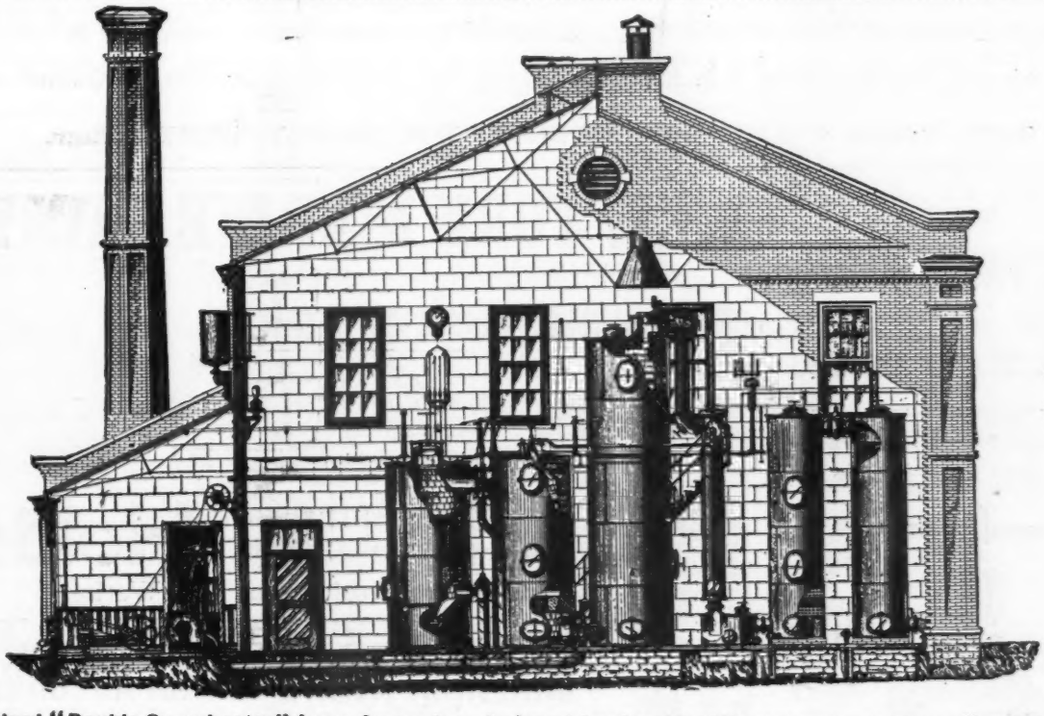

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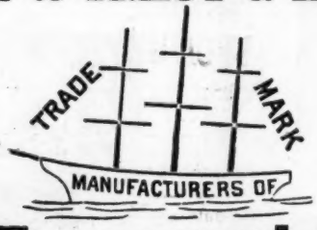

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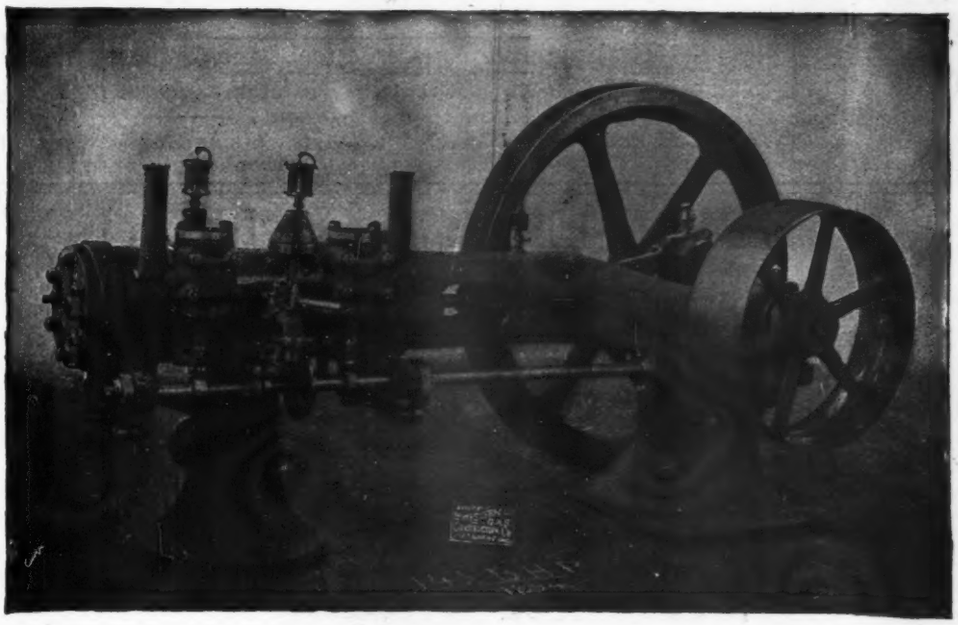

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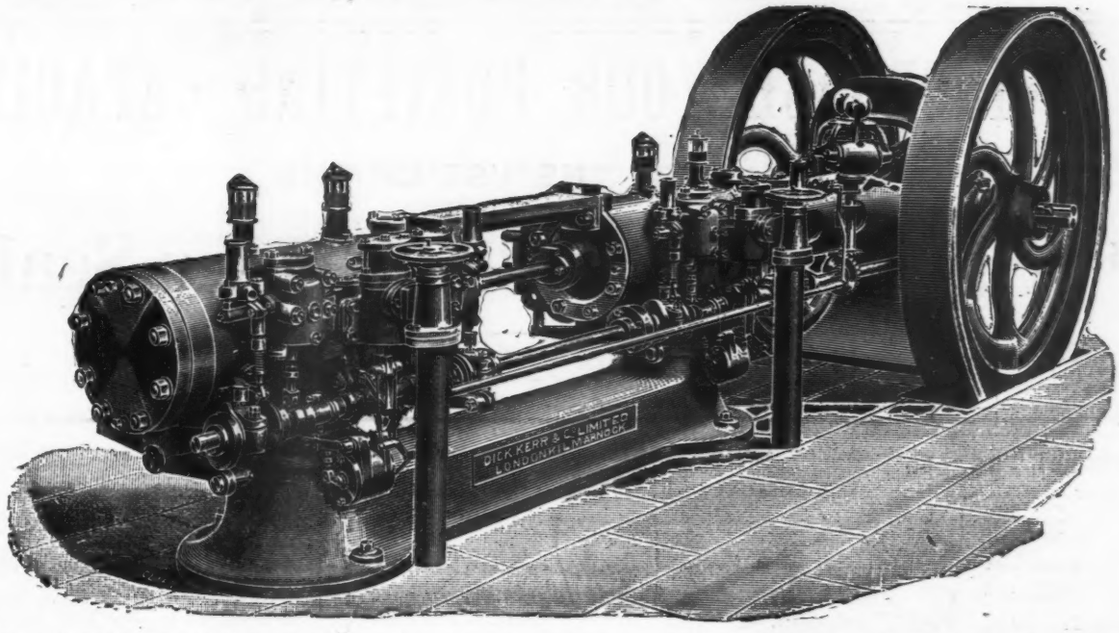

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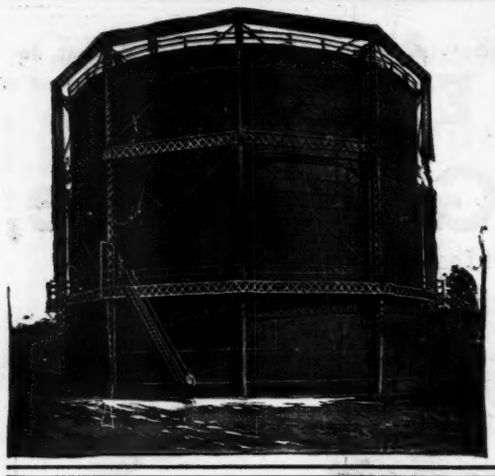

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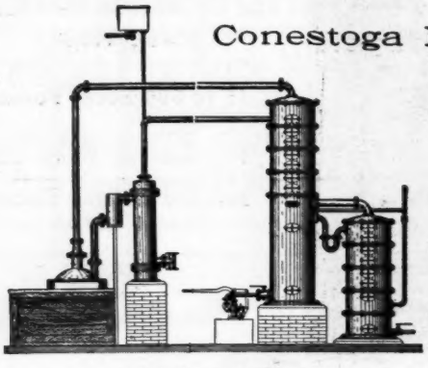

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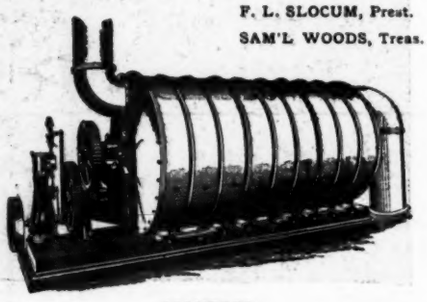

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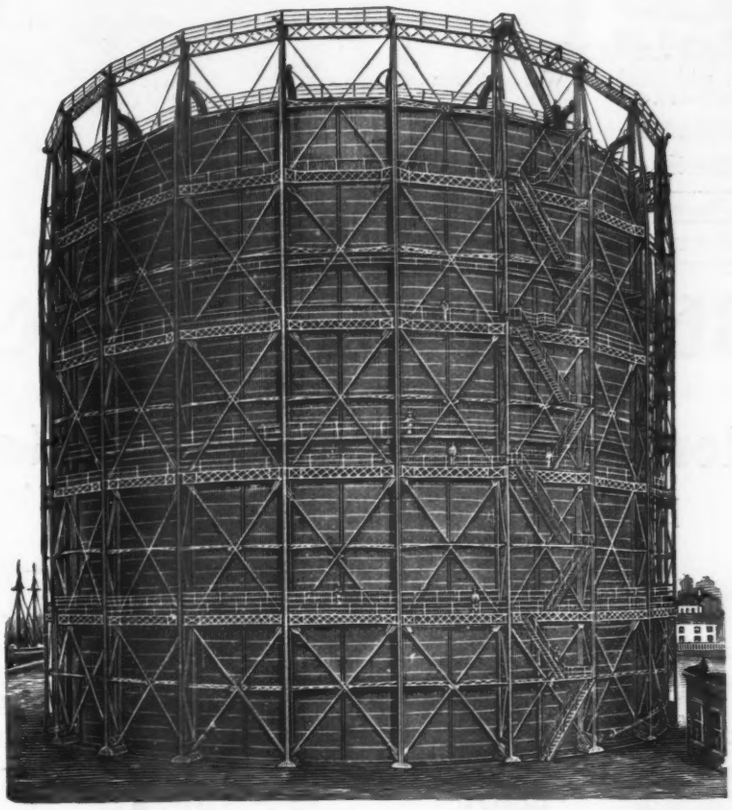

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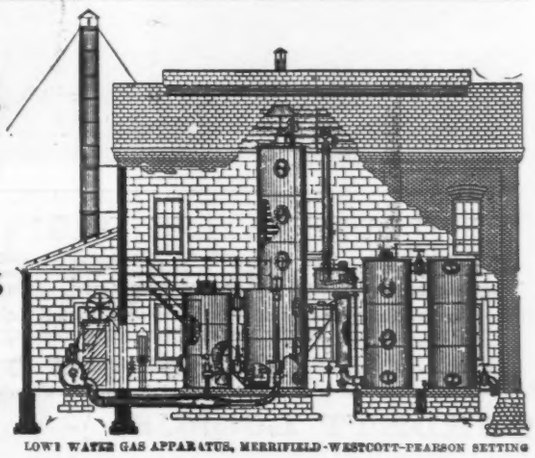

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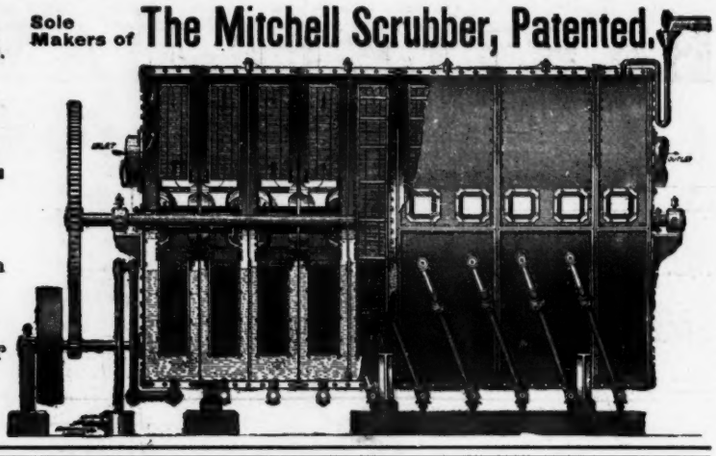

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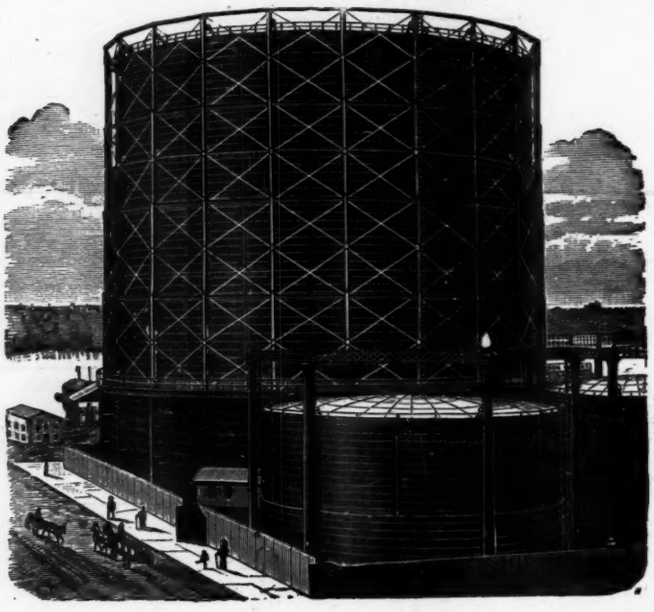

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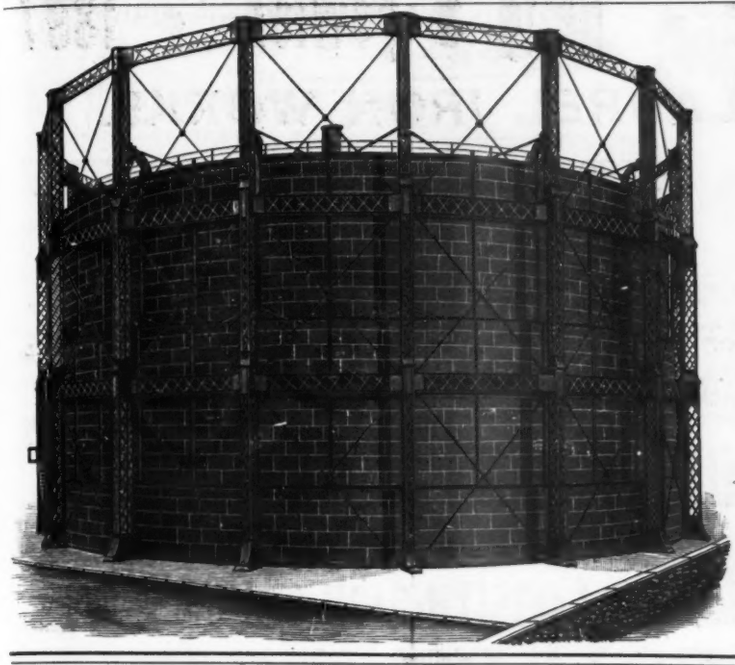

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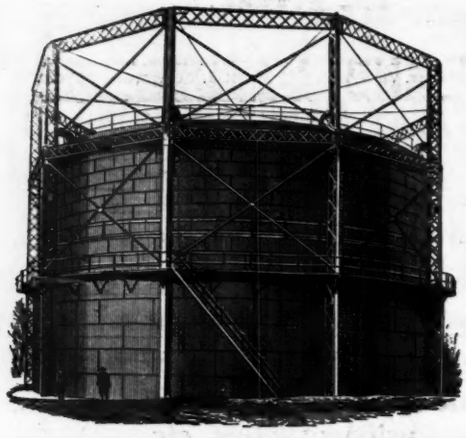

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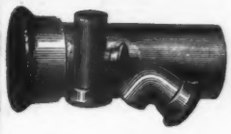

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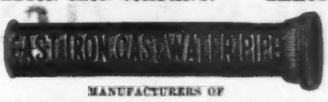

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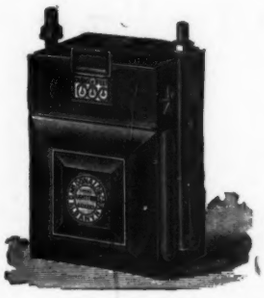

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